CIO

HE MAGAZINE FOR INFORMATION EXEC

JUNE 15, 1995
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COVER STORY

Reinventing The Heal

One Hospital's Client/Server Transplant

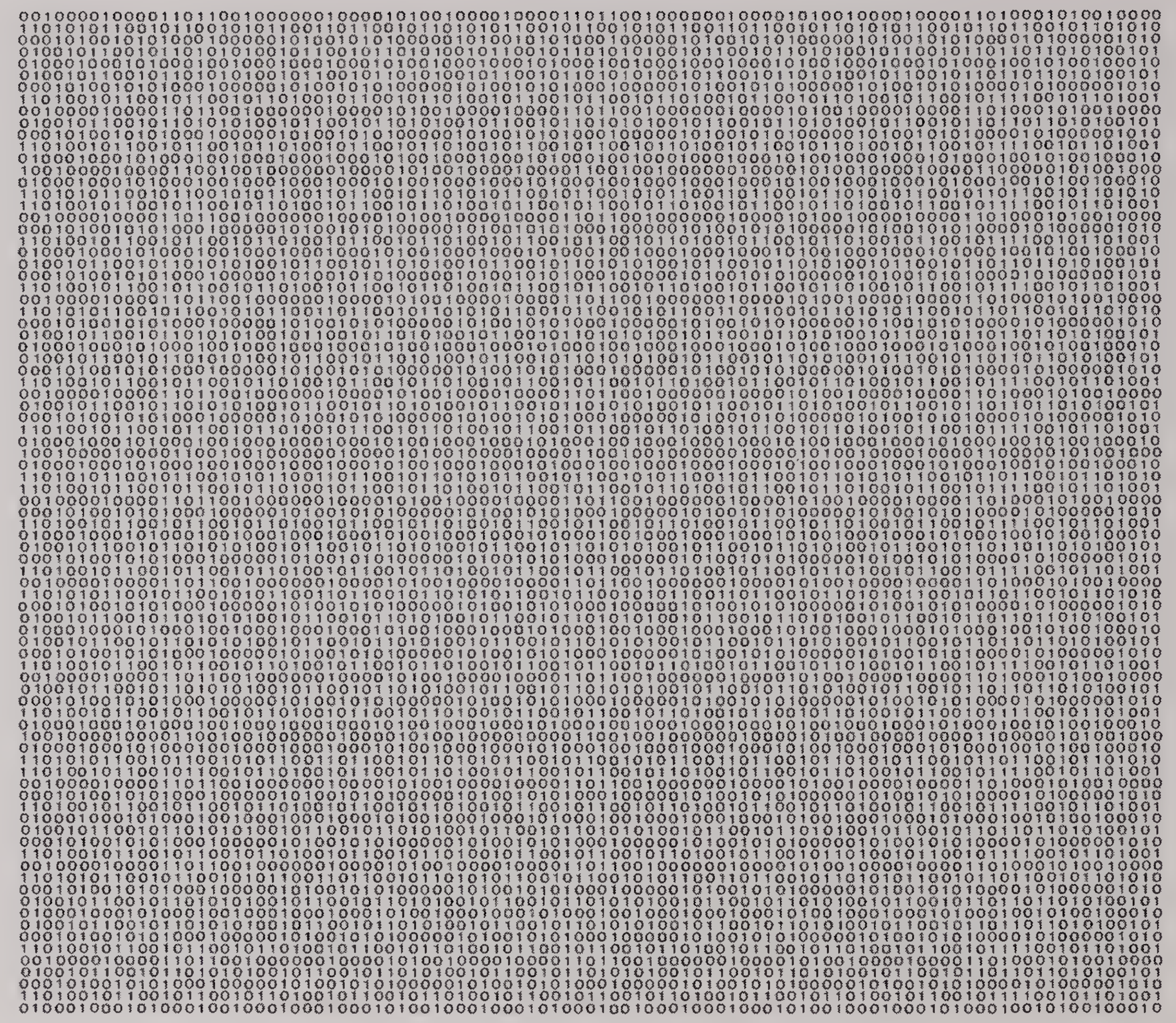
ALSO INSIDE

Financial Services Invests in IT

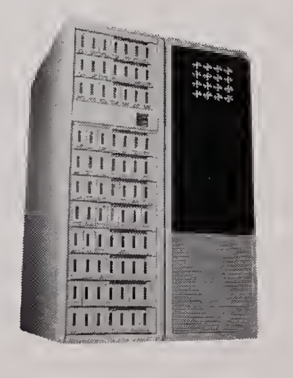
Brigham and Women's Hospital's
John Glaser

AN INTERNATIONAL DATA GROUP PUBLICATION

Your customer data has never really given you a clear picture of your customer.



Announcing The Open Parallel



Decision support is one promise of information technology that has never been fully realized. Its aim is to help you uncover trends hidden in your databases, so you can manage information to satisfy customers and compete more vigorously.

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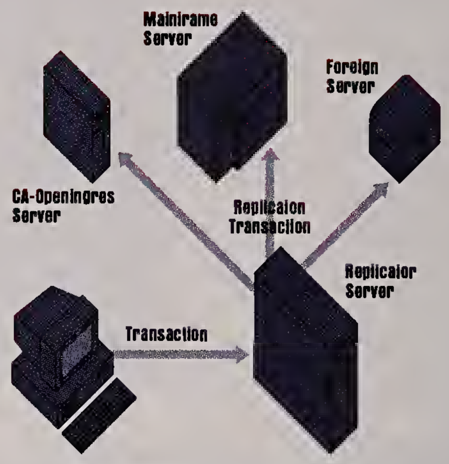

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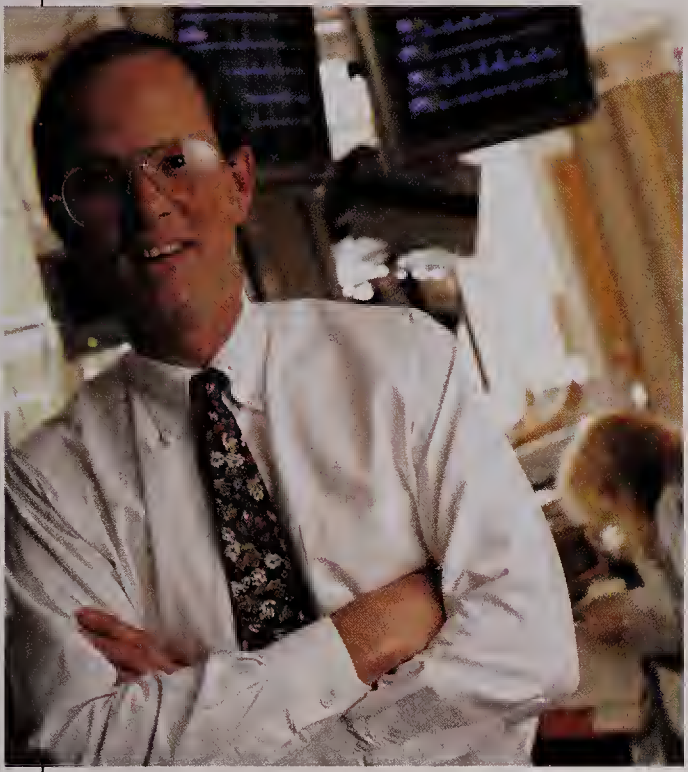

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Cover photo by Webb Chappell

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A Successful Operation

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CIO
Call for Entries
Enterprise Value Awards
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An index of all major articles published in *CIO* in the first six months of 1995, including a cross-reference by article type.

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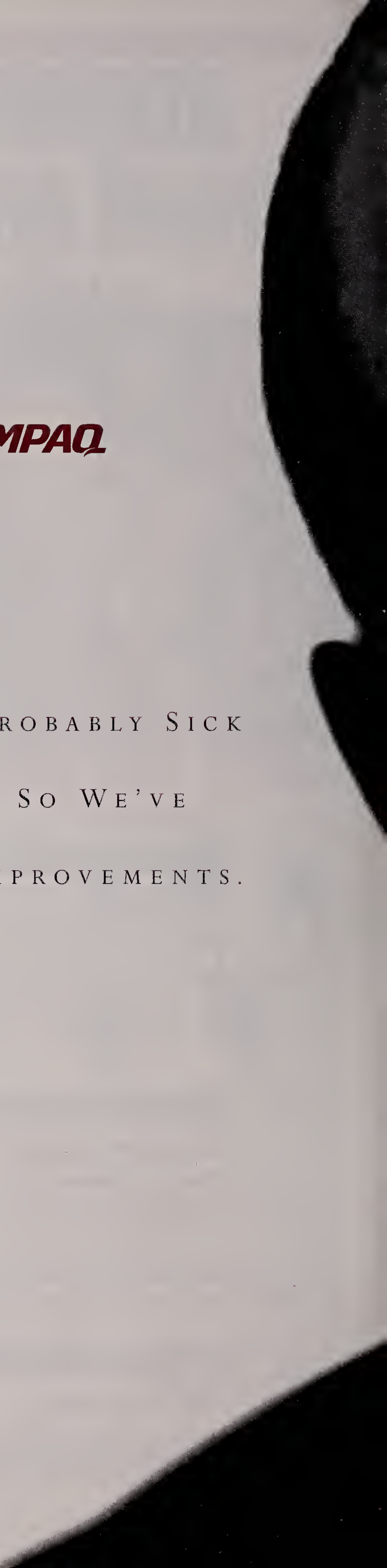

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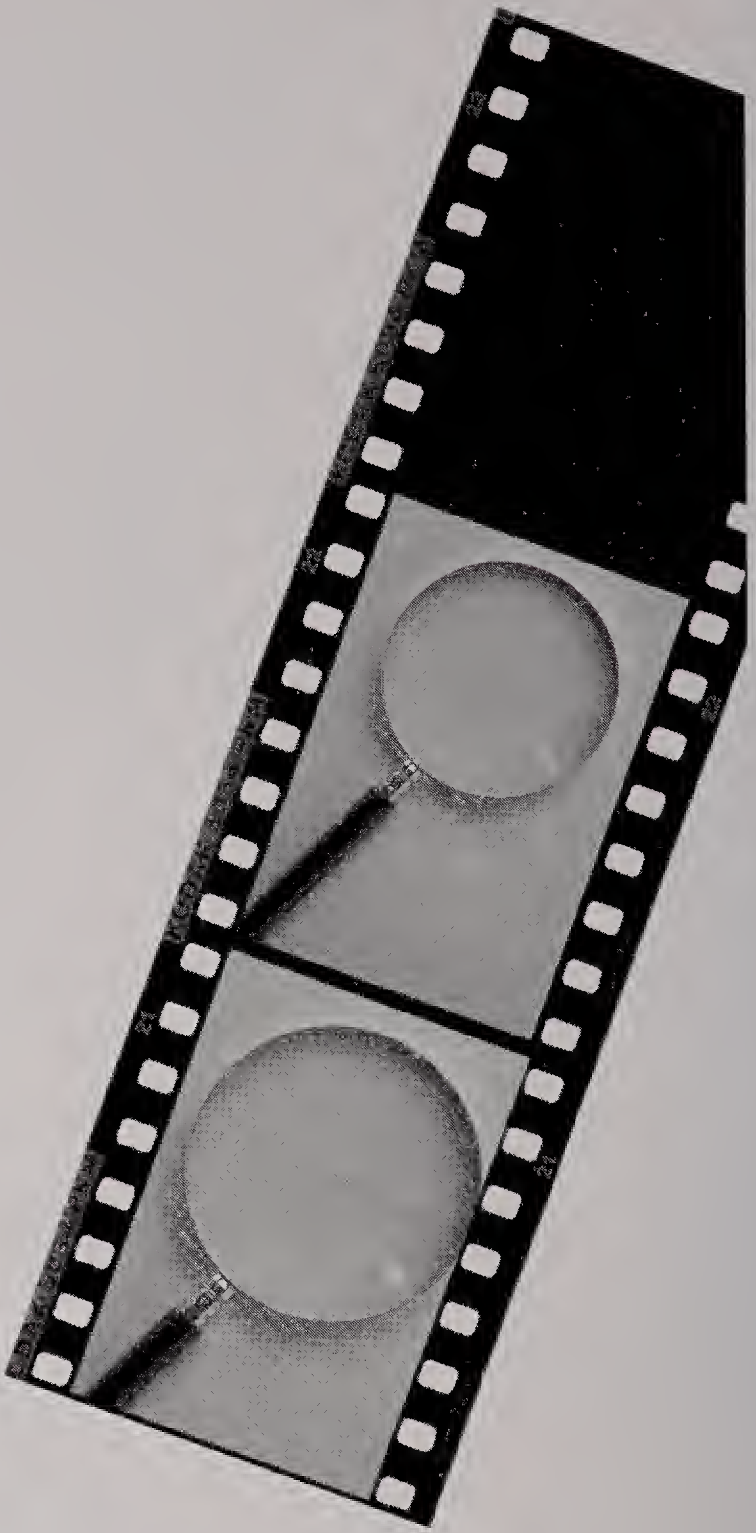

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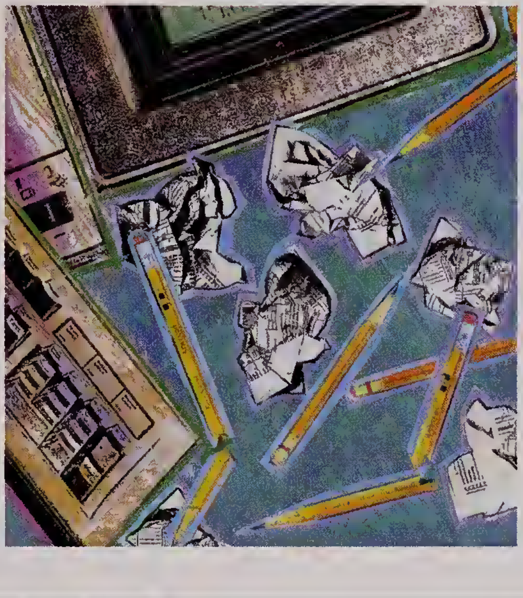

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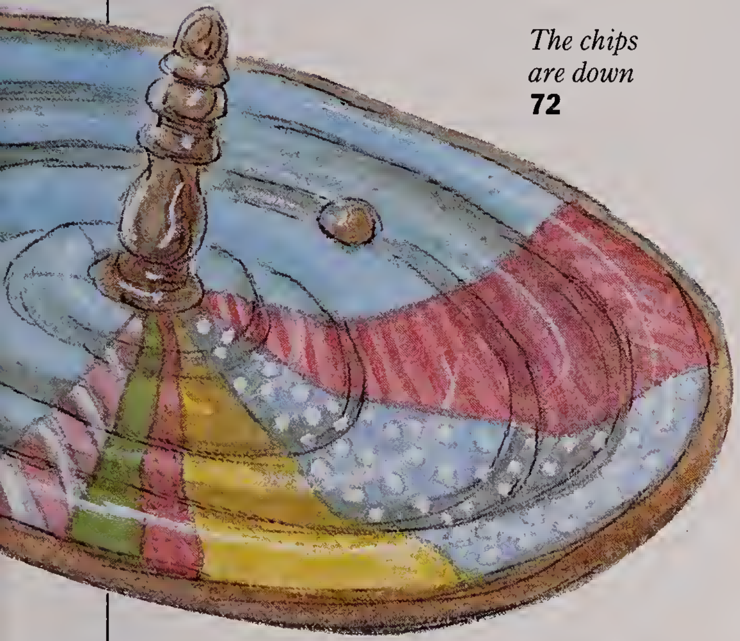

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LETTER FROM THE EDITOR

Like moths to the flame, IS executives are increasingly attracted to client/server technology.

The attraction is strong and growing. Forty-three percent of all applications in industries from manufacturing to health care now run on client/server architectures, according to Deloitte & Touche LLP's seventh annual survey of CIOs. A year ago, by comparison, just 27 percent of respondents' applications were running on client/server systems. What's more, 45 percent of CIOs say their companies will spend significantly more money on client/server technology over the next two years, the professional services firm found. (Look for more in-depth coverage of this study in our July "Outlook" column.)

Despite client/server's many business benefits, it remains a relatively immature technology fraught with implementation risks, nasty hidden costs and enormous complexities.

Perhaps for these and other reasons, corporate America continues to depend on legacy systems. Three-quarters of the survey respondents' mission-critical applications still run on them today. The health-care industry, however, is moving into the brave new world of client/server more aggressively than most. Of all the categories represented in Deloitte & Touche's survey, health care relies least on legacy systems.

To understand firsthand how a health-care institution migrates from a legacy system to a new enterprisewide platform, Senior Editor Richard Pastore visited Brigham and Women's Hospital in Boston. (See "A Successful Operation," Page 46.) The hospital began its client/server migration six years ago; the final major application conversion took place just this spring. Now Brigham and Women's has an industrial-strength client/server network that runs 90 major applications and links 4,200 clients and 7,300 users.

IS executives can get a taste of what Brigham and Women's CIO John Glaser and many health-care IS executives already know: A successful client/server implementation hinges more on good management techniques and architecture design than on the technology itself. And it doesn't happen overnight.

Editorial Director

P.S. *CIO* has entered cyberspace. Look for our new home page on the World Wide Web at *http://www.cio.com/CIO*.

CIO

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Editorial Offices CIO Communications, Inc., 492 Old Connecticut Path, P.O. Box 9208, Framingham, Mass. 01701-9208 (508) 872-0080, FAX (508) 879-7784. Printed in the U.S.A.
Subscriber Services (800) 788-4605, FAX (508) 872-0618.
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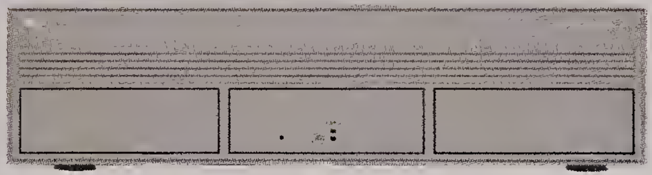

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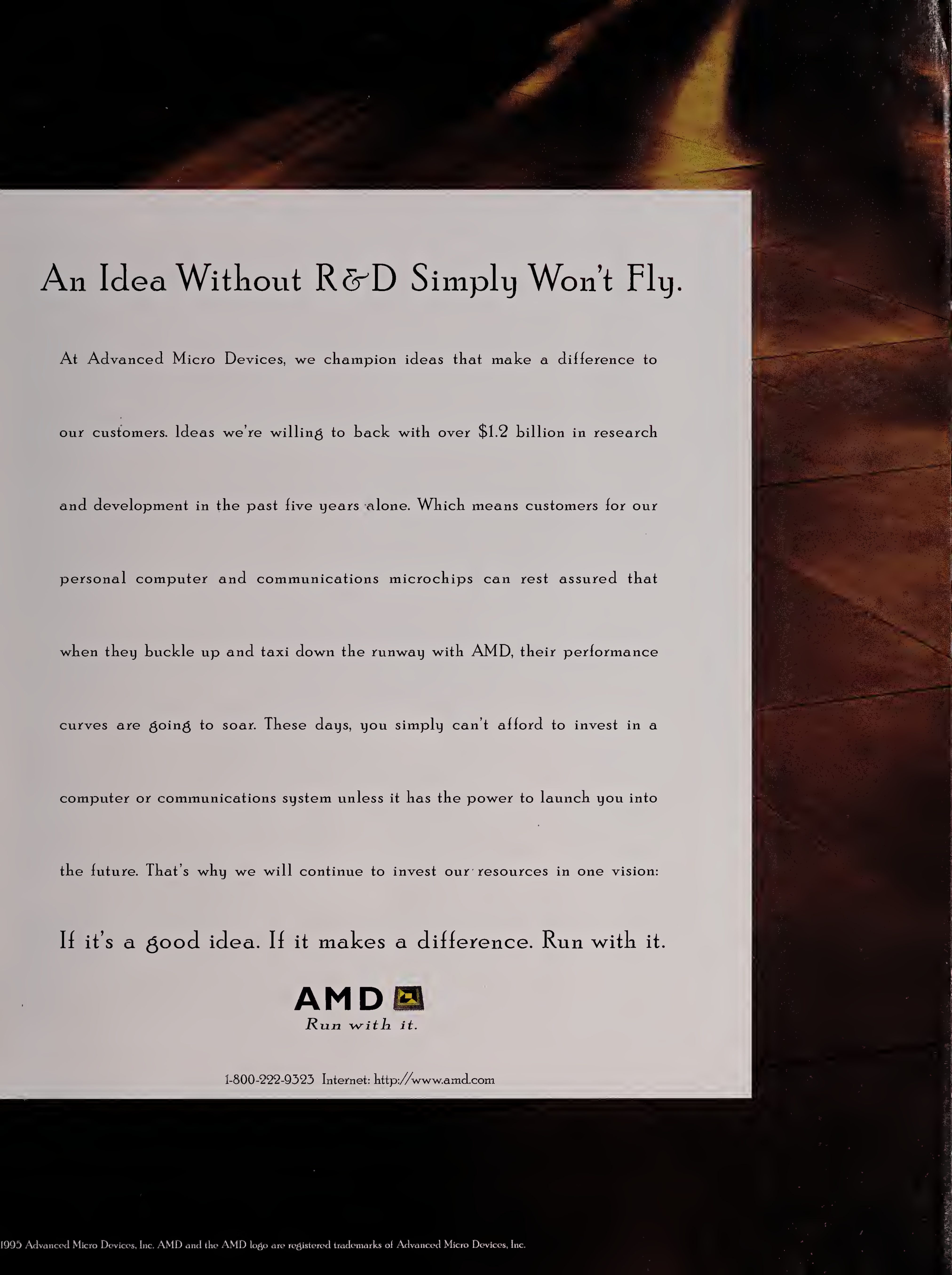

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LETTER FROM THE PUBLISHER

To wire or not to wire. That is the question. You are now faced with a decision that will affect your organization for years to come. But as a strategic thinker, you should consider not the question of whether to wire up to the Internet but of how your organization can leverage the Internet's tremendous power as a competitive weapon.

If fear, uncertainty and doubt (also known as the FUD factor) are permeating the air at your organization, you can always start small. E-mail applications that allow your employees to communicate beyond the boundaries of the company are a good place to break ground. Then you can begin investigating more-complex applications such as a site on the World Wide Web, electronic commerce, customer service and research, to name a few.

If all of this seems a bit overwhelming, we can offer some help. Enclosed with this issue of *CIO* Magazine you will find *WebMaster*. The *WebMaster* supplement is designed especially for IT executives and corporate webmasters who want to learn how to conduct business on the Internet and World Wide Web for profit. Application case studies, interviews with industry movers and shakers, Internet and WWW business trends, legal issues and more are explored within the pages of *WebMaster*. And if you would like additional insight, you can check out the *WebMaster* home page at *http://www.cio.com/WebMaster*.

At this point in the game, the question of whether to wire or not is really moot. Take some advice from Nike and "Just do it."

P.S. We are now taking reservations for the October 1995 CIO Perspectives conference, "The Psychology of IT: The CIO's New Mind Set," to be held Oct. 15-18 at the Hyatt Grand Cypress Resort in Orlando, Fla. To reserve your space, or for more information, please call 800 366-0246.

PHOTO BY WEBB CHAPPELL

Coming In CIO

Special Issue:

Knowledge Enterprises

Business information isn't limited to downtime reports, market-share statistics and profit-and-loss statements. While managers will always need that kind of information, they rely even more on direct observation, meetings, informal notes and impromptu conversations. Outside the firm, an ever-growing mountain of data sits waiting to be plucked. Companies everywhere have access to essentially the same information, so the emphasis has shifted from simply locating critical data to applying it better and faster than the next guy. In the words of Peter Drucker, managers must "think through what is information for them, that is, what data they need; first, to know what they are doing; then, to be able to decide what they should be doing; and finally, to appraise how well they are doing."

Special Issue:

The CIO-100

Learn from the best. In our eighth annual CIO-100 issue, we'll examine organizations that are exemplars of best practices in enterprisewide business processes. Many companies today are looking to improve their business practices in several strategic areas, either by modeling internal or external practices, or by benchmarking the practices of other firms with reputations for excellence in a given area. We'll honor 100 firms that are noted for best business practices in customer satisfaction, global operations, supply-chain management, finance/accounting or human resources development and show what role IT plays in their success.

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**The Pentium-based ProLiant turned in the lowest cost per transaction in* PC Week's *lab test featured in the April 24, 1994 issue.*

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TRENDLINES

I.T. IN EDUCATION

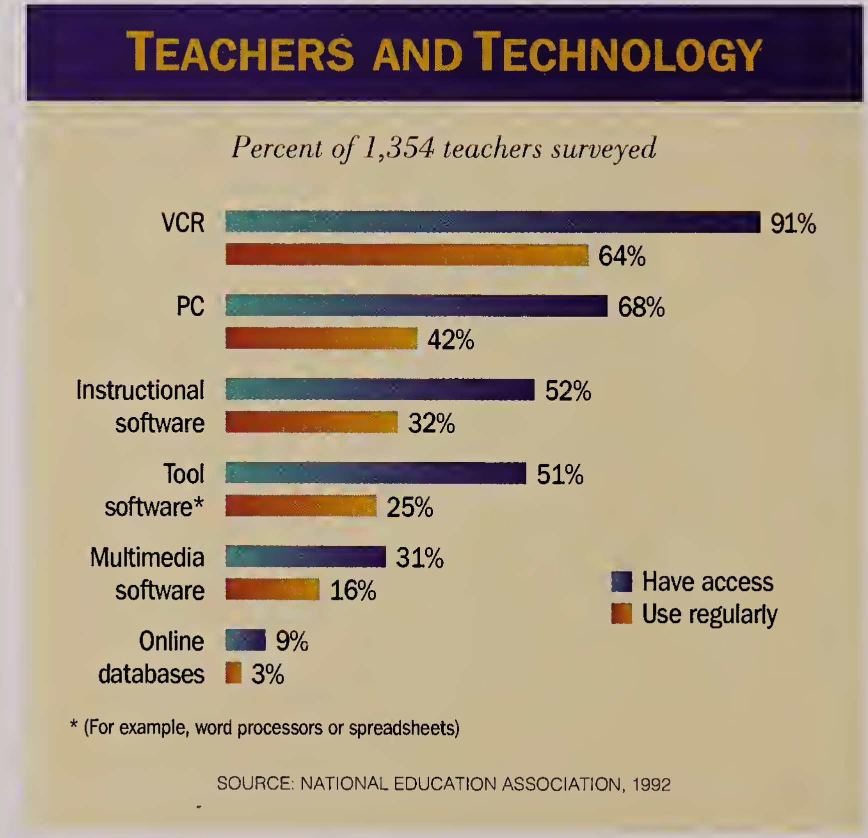
THOSE WHO CAN'T DO…

In the 1980s, the business world was plagued by the "productivity paradox"—the perception that vast spending on information technology was not paying off. Today there's another victim: U.S. schools. These institutions have spent millions on new computers in the last decade, but the grade that educators get for using technology effectively seems to be a dismal "F."

A new study by the Congressional Office of Technology Assessment, "Teachers and Technology: Making the Connection," reports that over the past decade, public K-12 schools spent roughly $500 million on computer hardware. And the pace of purchasing has been increasing: Since 1992, schools have added 700,000 computers each year. That represents an annual growth rate of 18 percent, up from 15 percent in the '80s. Currently, 5.8 million computers are being used for instruction in U.S. schools—one for every nine students (though half of those machines are old 8-bit Apple IIs).

The paradox is that all that technology spending hasn't been especially fruitful. Many schools are using computers merely to drill students on math and vocabulary. Most computers still reside in labs rather than in classrooms and so are not being integrated into teachers' lessons. And modems, more often than not, reside only on the central computer in the principal's office. Only 9 percent of secondary school students report using computers in English classes and only 6 to 7 percent in math classes.

The sources of this paradox are many, including a lack of vision, overwhelming costs and logistical problems in rewiring old schools. But, says the OTA, insufficient



* (For example, word processors or spreadsheets)

SOURCE: NATIONAL EDUCATION ASSOCIATION, 1992

WASTE WATCHERS

Your company probably already does it with paper, and possibly with soda cans as well, but what about computers? According to Rumarson Technologies Inc. (RTI), a Kenilworth, N.J., firm that specializes in computer recycling, it's in companies' best interests to keep their old PCs and peripherals out of landfills.

Government sanctions and landfill regulations can make it difficult to dispose of old computer equipment, according to RTI. Not only that, but significant financial benefits can be gained by recycling the equipment instead. Enter RTI, which offers several environmentally acceptable alternatives.

Wherever possible, RTI will refurbish outdated equipment and redistribute it to users worldwide who don't need to be on the cutting edge. Such trade-ins are coordinated through major manufacturers such as IBM and Lexmark International and result in credits for clients toward new systems. In addition, clients gain a tax advantage since computer trade-ins are not taxable under the Federal Tax Code, whereas selling off the equipment would be, according to RTI.

If equipment is defunct, RTI breaks it down, recycles all possible resources and guarantees EPA-approved disposal with a certificate of environmentally safe destruction. Call 800 929-0029.

CHART BY CHRISTINA WILLIAMS; PHOTO BY TONY STONE IMAGES / PETER POULIDES

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The Means to Make Better Decisions

Providing the means to deliver accurate and timely information to improve work processes and make better business decisions is the job of George Alameda, Chevron U.S.A. Production Company's Manager of Information Technology.

The company is using the SAS System to help with enterprise-wide information delivery. "Our mission is to make financial, operational, and reservoir data available in an easy-to-use format to all the asset teams at work in CUSA Production Co.," says Alameda. "We've found the SAS System is a superior solution for analyzing data, turning data into useful metrics, and guiding our cross-functional teams toward improved work processes."

One team, in CUSA Production's Western Business Unit, is tracking the profitability of individual wells. "It's a tremendously difficult task to optimize our field operations for maximum profitability," says Alameda. "With the SAS System, we can integrate large amounts of data and build a picture to compare one field against another and challenge our asset teams to identify and share best operating practices."

Reaching for the Best

Alameda looks forward to extending the use of the metrics and performance monitoring data to employees trying to improve their work processes. He admits his vision is far reaching, but so is the SAS System. "Our challenge is to be better than the best," he concludes, "and the SAS System is helping us reach that goal."

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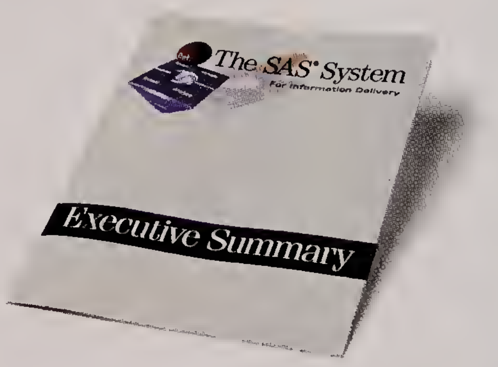

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time and opportunity for teacher training are the biggest barriers.

U.S. schools spend, on average, only 15 percent of their technology budgets on teacher training. Less than half report that an introductory computer course is available for teachers in their school districts or at local colleges. In three-fifths of all schools, no one has any portion of the work week officially allocated to coordinating computer activities.

"You wouldn't want a doctor to remove your gallbladder without the latest technology and the skill to use that technology, would you? It's the same with teaching," says Rusty Sweeny, an algebra teacher from Piscataquis Community High School in Guilford, Maine.

The recommended policy implications of the OTA study are crystal clear: no training, no funding. The OTA calls on Congress to "require that all [school] applications for federal financial help that include technology show adequate budgets for high-quality support and preparation of staff."

Some states have already taken such steps. For example, the Florida legislature allocated more than $60 million for technology in the 1993-94 school year and required that schools seeking funding set aside at least 30 percent for teacher training.

Finding time for teachers to attend workshops, experiment with software and plan new lessons that exploit computer tools may require more than a whack from the funding stick, however. Changing the rhythm of the school day and creating incentives to motivate teachers to retrain will be necessary as well, according to the OTA.

Although political affiliation in this country is roughly evenly divided—33 percent Republican, 31 percent Democrat and 36 percent Independent or other—users of the Internet seem to lean right. According to a recent *Newsweek* poll, the cyberspace constituency is 48 percent Republican and only 24 percent Democrat.

A copy of the OTA's study can be obtained for $19 by faxing the U.S. Superintendent of Documents at 202 512-2250 or free of charge on the World Wide Web at *http://www.ota.gov*.

–E.B. Baatz

GAME THEORY

Despite the fact that a significant number of us admit to playing computer games at work (see "Trendlines," *CIO*, April 1, 1995), most organizations don't encourage game playing of any kind on company time. But they might if they knew about Celemi's business-simulation board games.

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Celemi—which claims its products increase learning retention and comprehension as much as 200 percent—also designs games for personnel in sales and marketing, health care and other industries and functions. Current users include GE, Hewlett-Packard, Compaq, Rolls Royce and National Semiconductor.

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Before a newly formed whole can be more than the sum of its parts, there must be some kind of integration. Just ask the IS staff at any hospital involved in a merger: The increasing pace of such unions creates one big headache for their IS departments.

Indeed, integrating systems across multiple facilities has become the top priority for health-care IS executives, according to the sixth annual leadership survey by the Health Information and Management Systems Society, a Chicago-based professional association. Eighty percent of the 976 participants said their

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organizations are already establishing integrated data systems or plan to do so. That priority differs markedly from last year's number-one concern: preparing for the changes recommended in the Clinton administration's health-care plan, later scrapped by Congress. The survey, cosponsored by Hewlett-Packard Co., also indicates that most respondents think:

- Managed care has fueled increased computerization;
- IS budgets are continuing to rise; and
- Multimedia technology appears promising.

But there was no consensus among respondents on the significance of two widely hyped technologies: the Internet and computerized patient records.

The failure of last year's biggest issue, health-care reform, pushed integrated systems to the top of this year's IS worry list. "There are probably 50 different initiatives going on in 50 different states," says Rick Shoup, vice president of IS for Tufts Associated Health Plans in Waltham, Mass. "They need integrated delivery systems to support those initiatives."

In a related finding, only 20 percent of the respondents said they rely on strategic IS planning, which HIMSS President Nancy Aldrich attributes to a rapidly changing environment that complicates predicting anything beyond the short-term future.

Nearly one-third ranked the movement to managed care and its attendant cost controls as the most significant force driving increased health-care computerization. At the same time, 88 percent of respondents said they expect IS spending to increase over the next two years, with 29 percent predicting a jump of 50 percent or more. And much of that spending is likely to go toward emerging technologies: Eighty-four percent of respondents said their organizations use or plan to use multimedia, primarily for training or remote diagnostics, and 65 percent said they have invested in telemedicine.

But despite strong media and industry attention, computerized patient records are far from universal acceptance: 68 percent indicated some hesitation about implementing them. And whereas 56 percent called the Internet valuable for physician networking, 27 percent said the global computer network has had little real impact on the health-care industry.

Shoup and Aldrich both attribute lukewarm interest in those technologies to unanswered questions about their industry's biggest concern: keeping patient records confidential and secure.

–Anne Stuart

SMALL TALK

Just because a company is small doesn't mean its IT spending power is diminutive. Indeed, according to BIS Strategic Decisions, small businesses will spend $73.6 billion in 1995 on PC-, telephone- and image-based products and services, representing an increase of 40 percent since 1992.

"The U.S. small-business market will be one of the fastest-growing markets for technology products in 1995," says David Lieberman, director of small business and home office research for the Norwell, Mass., research firm. "In fact, spending in 1995 will be robust, with 74 percent of small businesses expecting to spend the same or more than they did in 1994."

Other findings of BIS's "1995 Small Business Survey" of 1,200 firms with fewer than 100 employees include:

- **Small businesses generally have a low level of technology sophistication and low expectations about what technology can do for them;**
- **Small-business owners' number-one goal when buying technology is improved productivity;**
- **Owners and principals manage the entire buying process for their organizations at more than 70 percent of small businesses, and more than 60 percent require that technology investments pay for themselves within six months; and**
- **The favorite source for technology products among small businesses is office superstores.**

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WHEN YOU NEED PROFESSIONAL HELP

If your company is one of the many small businesses spending big on technology (see "Small Talk," left), you're probably finding yourself with an increasingly complicated support situation. Using an ever-growing assortment of products from multiple vendors can make it tough to get solutions when problems arise.

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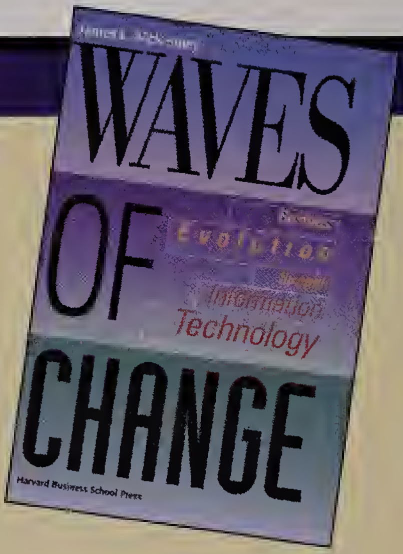
James L. McKenney
WAVES OF CHANGE
Business Evolution through Information Technology
Harvard Business School Press

WAVES OF CHANGE

BUSINESS EVOLUTION THROUGH INFORMATION TECHNOLOGY

By James L. McKenney
with Duncan G. Copeland
and Richard O. Mason
Harvard Business School Press (Boston), 1995
230 pages, $29.95

Given the pervasiveness of IT in business today, it's easy to forget that a mere four decades ago, computers were restricted to research centers and corporations used manual processes that look positively archaic in 1995. Back then, trailblazers in the use of business technology had rough terrain to traverse, even when their efforts were successful. In *Waves of Change*, James McKenney, Duncan Copeland and Richard Mason chronicle a few examples of such early IT projects and draw out valuable lessons for modern-day pioneers.

The authors describe a number of landmark IT projects that proved to be potent standard-setting competitive weapons for their respective industries. Led by technical "maestros" (executives who were often the CIO equivalent), these firms had their ups and downs in putting technology to work. In their efforts, the faith and confidence of both workers and management and a clear understanding of the project's value was vital for successful deployment, the authors argue. By studying these examples and learning from their mistakes, the authors contend, executives can gain insights into their own IT endeavors.

McKenney et al. focus in particular on the groundbreaking efforts of Bank of America and American Airlines. Both companies pushed the limits of available technology and the capabilities of their staffs; yet in doing so, their leaders created strategies that led the organizations to a new plane of operation.

Bank of America hired Stanford Research Institute in 1952 to design a check processing system from scratch. SRI built the prototype system, called ERMA, along with a numerical check sorting system that became the standard for bank check processing. The new technology spurred other IT projects that led to the development of new services such as Bank of America's credit card, the precursor to Visa.

Planning and coordination among top management was essential to the project's success, the authors emphasize. The management committee recognized that human planning—training staff and heading off technophobia—was at least as important as preparing for equipment and buildings. Senior management stood firm in its support even after some initial setbacks.

Likewise, support from the top was invaluable to the development of American Airlines' Sabre ticket reservation system. The teleprocessing system was a vast improvement over the old manual method, which required some workers to use field glasses to monitor changes on a wall-mounted display board across an auditorium-sized room. Sabre improved reservations efficiency tremendously. By the late 1960s, however, American had new leaders who did not place a high priority on modernizing IT, and the airline lost its edge, only to regain it a decade later when Sabre was expanded to include sites at travel agencies.

In each case study, the authors emphasize the managerial actions that led to organizational changes spurred by new technology. "These leaders never had a complete picture of their destinations; they just took the next few steps toward a strong goal to solve a limiting processing situation," the authors write. They also include analyses of industry trends that put these actions into context.

Waves of Change goes into great depth on the American Airlines and Bank of America examples, providing perhaps more detail than most readers would care to know. Nevertheless, on these ground-breaking systems and several others, it offers valuable historical perspective.

–Peter Fabris

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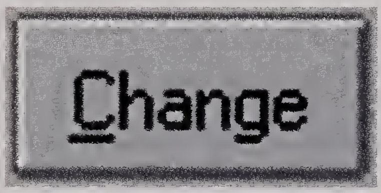

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Winning the Mobile Game

The key to victory is choosing the appropriate information access and delivery technologies

BY SAMI JAJEH

One of the first great masters of chess, Savielly Tartakower, once described the game's opening position this way: "The mistakes are all there, waiting to be made." Just as the seasoned chess professional turns a studied eye to the pitfalls awaiting his first move, so should the CIO carefully assess his options before advancing into the mobile computing game.

Developing and maintaining applications for use by hundreds, or even thousands, of mobile workers—not to mention keeping versions in sync and data integrity intact—can be a daunting task. Consider the CIO who rolled out a mobile computing solution to 1,000 users after a successful 30-person pilot only to find his communications costs balloon to triple his budget and his projected eight-server requirement swell to more than 80. Or the IS manager who equipped a 2,500-person sales force with fully loaded, $6,000 laptops only to have them boycott the use of the applications.

ILLUSTRATION BY FRED LYNCH

Selecting the right mobile solution can be difficult because most mobile computing technologies are still emerging. What's more, for all but the smallest of implementations, issues of reliability, scalability, cost and security must be addressed. Other considerations, such as training on-the-road users and keeping laptop software updated, further complicate matters. The single most important decision the CIO will make is the selection of the appropriate information access architecture—or architectures—upon which to build applications.

There are four primary access and delivery technologies:

- **Remote LAN Access (RLA)** allows mobile users to access an enterprise LAN as if they were local. Users dial into an RLA server and, using its resources, work online as though they were physically attached to the LAN. While this technology approach allows users to enjoy the benefits of the LAN, speed becomes an issue. Client/server applications architected for the 10Mbps (or greater) bandwidth available on a LAN can crawl over a 9.6 or 14.4Kbps connection.
- **Remote control** software allows a mobile user to literally "take control" of a specific PC on a LAN. Rather than work through a server, the user dials via modem directly from a portable computer into a desktop PC and then emulates it. This technology is particularly useful for IS managers who want to perform remote trouble-shooting or maintenance from home, or for mobile trainers who need to walk users through applications without being beside them.
- **Remote-enabled** versions of personal productivity software allow mobile users to dial directly into PC resources or servers to access databases, send and receive e-mail or

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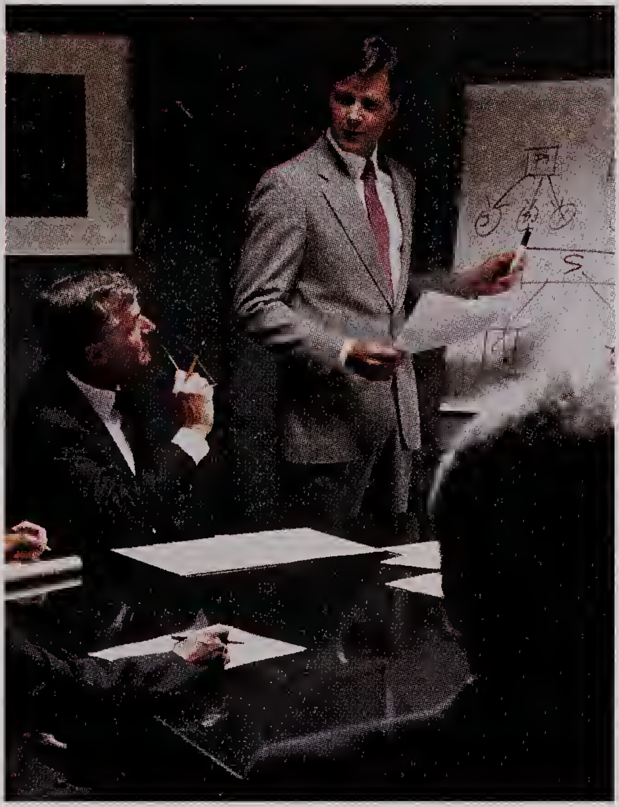

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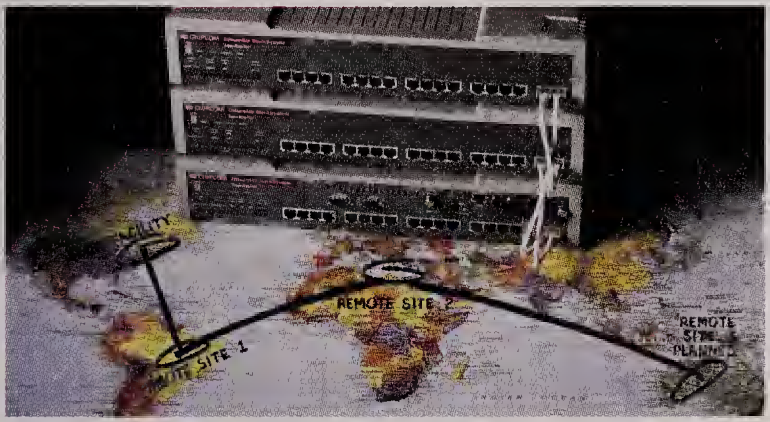

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CASE ONE

Requirement: *A headquarters-based LAN administrator wants to administer the LAN from home by communicating to his desktop PC residing on the LAN.*

Solution: A sole PC professional who needs to tap the resources of a LAN-based PC should use remote control software.

perform other functions. But because each application requires a different software package, the user may need to make multiple phone calls.

- **Agent-based messaging** systems use a client/agent/server model to adapt the traditional client/server model to the idiosyncrasies of mobile computing. Mobile clients dial into a LAN-based agent, which works on their behalf to access the server and other resources of the LAN. It also uses store-and-forward technology to "stage" messages and transactions to minimize connect times.

Specifically, the agent may hold—or stage—information to be downloaded to or from the mobile user. When the user calls in, the agent picks up information and task requests from the mobile user, performs the appropriate information synchronization, services all the requests, and drops the connection. During this communications session, information such as order entry, database queries, report requests and electronic mail may be delivered to the agent or server. Or, if the tasks requested or the information sychronization will demand a long connect time, the agent may perform the tasks after the user hangs up and stage the resulting information for download on the next call.

CIOs do not have to choose one access method for the entire organization. In fact, each technology is best suited to a different type of mobile computing, and many organizations will require more than one variety. The key is knowing when to use which method. To do that, you must analyze three critical factors: the user profile, the application type and the communications model.

First, ask yourself the following questions about your mobile users: Will they be part of a small team or part of an enterprisewide group, such as a 500-person sales force? How often will they connect to enterprise networks? How much time can they afford to spend on each connection? Are they field professionals or PC professionals?

Field professionals are responsible for "bounded" tasks that are repeated frequently. They sell, service, survey or deliver—but they do not necessarily compute. PC professionals (or knowledge workers) rely on computers to perform the "unbounded" tasks that define their jobs. They assess, analyze, share and collaborate.

Next, examine the applications required. Are they primarily personal productivity applications, such as word processors or personal information managers, or are they applications that could affect your organization's productivity—applications that handle such tasks as order entry, inventory queries and product pricing updates? Do you want your mobile applications to automate common line-of-business processes or to foster more free-form collaboration among people who travel or work in disparate locations?

CASE TWO

Requirement: *Ten departmental telecommuters work primarily in the office using collaborative client/server applications but need to access these applications two days per week from home.*

Solution: The manageable number of PC professional users performing primarily collaborative tasks suggest a remote LAN access solution or remote-enabled version of the collaborative software.

Finally, consider how your mobile users will try to communicate with headquarter-based systems. Will they be usually connected or usually disconnected? The former primarily use computers connected to enterprise network resources but occasionally need to take their work with them when they travel or need access from home. The latter typically are field professionals who perform most of their activities remotely and so rarely need to be connected to enterprise network resources. They may not have worked with computers at all prior to the mobile computing implementation.

CASE THREE

Requirement: *Three hundred mobile sales professionals need to communicate sales orders electronically while retrieving inventory status, sales reports and pricing updates.*

Solution: Information access and delivery to a large number of field professionals requires an agent-based messaging system.

"Usually connected" workers are familiar with the fruits of a traditional LAN-based client/server architecture. While working on the LAN, they enjoy continuous, high-speed, reliable connections and have fast access to online databases. They are insensitive to the time they spend connected and to the volume of data they transmit using the LAN. They only occasionally leave this environment and go mobile.

Conversely, field professionals are "usually disconnected" because they primarily require access to central corporate systems from a remote location. Their remote communications environment is slow, unreliable and costly. Database access is limited and must be scheduled or staged. Users must establish their own connections and minimize the time it takes to do their work to keep communications costs in line. These users rarely, if ever, enjoy the benefits of the local LAN environment.

When the information access technology chosen is out of sync with users' work styles, applications and communications needs, the result can be out-of-control communications, training and systems-management costs, and disgruntled users who boycott the system. Matching the right information access technology to the different user profiles, application types and communications models in your organization can make you a winner in the mobile computing game and help you avoid the costly mistakes that are "all there, waiting to be made."

Sami Jajeh is a director of market development at XcelleNet Inc. in Atlanta.

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Test Practices

No longer restricted to high-tech certification programs, computerized testing is making its mark in a range of applications

BY E.B. BAATZ

Nurses and pilots do it. Aetna Life and Casualty employees get paid to do it. Some graduate students are finally doing it. Architects are thinking about doing it, too. And the U.S. government encourages it. Throw away those number-two pencils—it's computer-based testing and it's coming on strong.

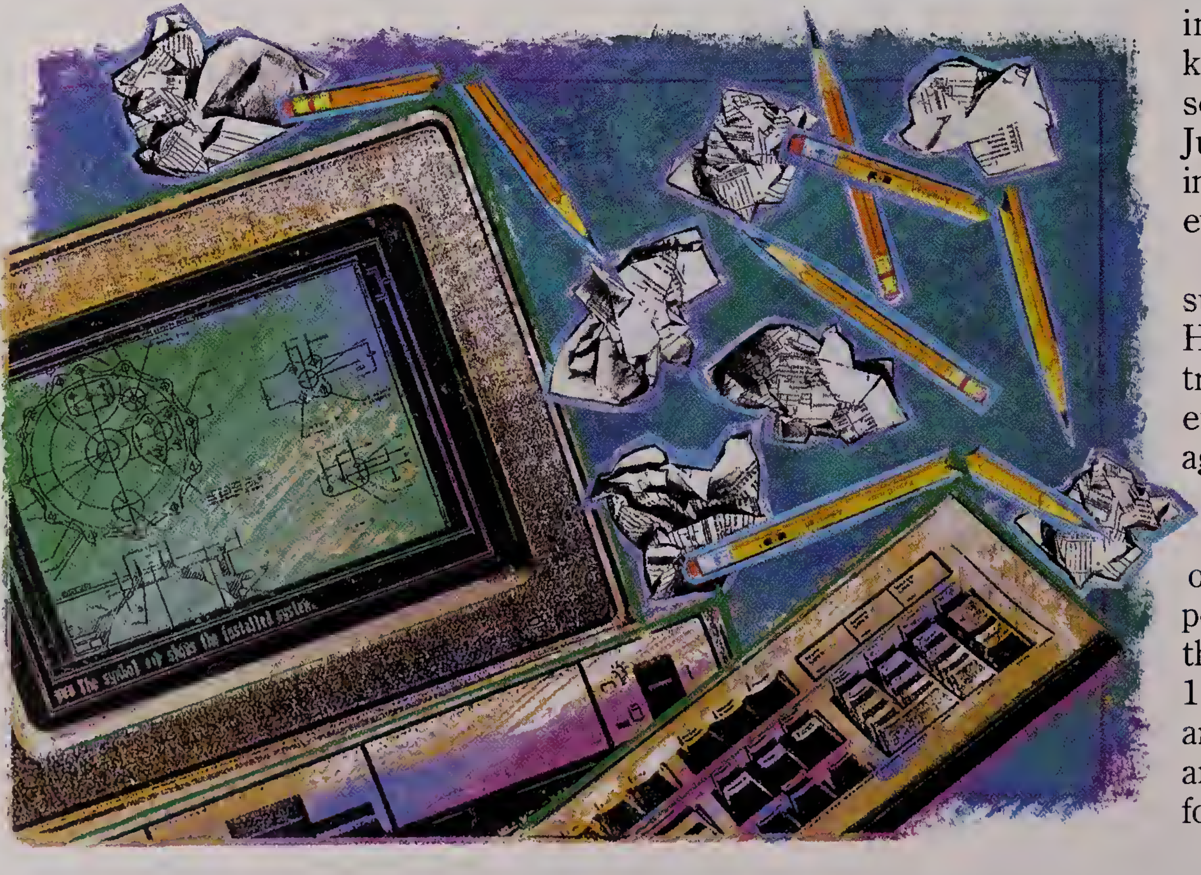
The Graduate Record Exam (GRE), for example, the test that students take to get into graduate school, was first offered on computers in November 1992; now the paper-and-pencil version is gradually being phased out. The license exam for registered nurses has recently shifted to computers, too. And in June 1995, the last of the paper tests that the Federal Aviation Administration (FAA) gives for pilots, mechanics and flight engineers will be removed while computer-based tests take off.

Professional certification programs, educational entrance exams and corporate training strategies are all being reshaped by the somewhat belated entrance of the PC into the mainstream testing world. Professional certification is playing a particularly prominent role in driving this trend, as the number of workers seeking certification increases: Air-conditioning contractors and French chefs, commercial radio operators and New York bankers, Fortune 500 purchasing managers and neighborhood grocers are now all among them.

To IS executives, computer-based tests are nothing new. Ever since Novell Inc. established the Certified Network Engineer program in 1989, testing and certifying has been a hot ticket in the IT world. Hewlett-Packard Co., Microsoft Corp. and Lotus Development Corp. all sell their own certification programs, including batteries of computerized tests.

But other executives are now dipping their toes in the testing waters, too. "The CFO is beginning to ask for accountability [in the company's training program]," says Wallace Judd, a pioneer in computer-based testing and now a vice president and research fellow at Kelly Services Inc., an international staffing services firm based in Troy, Mich. "If you are a CFO, you know that your company's biggest asset is the skill of its employees," says Judd. "It's an asset that is not being inventoried, and often the CFO is not even aware of how to inventory it."

Business demand for testing is surging for lots of other reasons, too. Human resources executives see training and testing as a way to help employees along a career path. Managers who oversee total quality management initiatives view computerized tests as a source of reliable, objective metrics to gauge employee performance. And with the passage of the National Skill Standards Act of 1994, which promotes assessments and certification in order to maintain and build the skills of a global workforce, even the federal government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CIO PERSPECTIVES

Conference Preview

FEATURING

PETER SENGE

The Challenge for Fundamental Change

■■■

Myers-Briggs Personality Types

PLUS:

New Business Strategies — New IT Opportunities

Think Global, Implement Local

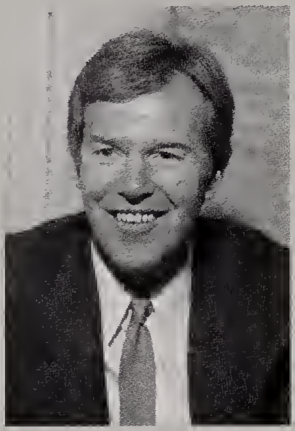
Assumptions for the Digital Economy

The Sociopathology of the Internet

THE PSYCHOLOGY OF IT: THE CIO'S NEW MIND SET

OCTOBER 15–18, 1995 ■ HYATT GRAND CYPRESS ■ ORLANDO, FLORIDA

Jim Wetherbe
Conference Moderator



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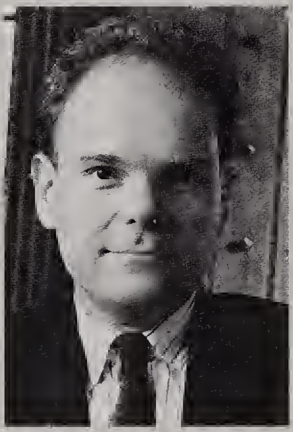

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The Psychology of IT: The CIO's New Mind Set

OCTOBER 15–18, 1995 ▪ HYATT GRAND CYPRESS ▪ ORLANDO, FLORIDA

Change and growth, personal and professional, is everywhere and constant. And resistance is continuous. As the nature of IT has changed so radically over the past five years, so have the requirements for being a successful CIO.

These include coaching rather than managing, and establishing your IT division as a business unit; in short, changing your thought processes, your personality and your communication skills.

The Psychology of IT brings together visionaries such as the CEO of the Center for Applications of Psychological Type (the not-for-profit center that compiles Myers-Briggs Type Indicators research), and the vice president of People Systems from Saturn Corporation with the Chief Visionary of First Virtual Holdings Inc. Our roster also includes the CIOs of Allstate Insurance Company, VeriFone, Owens-Corning Fiberglass and The Gillette Company. They, along with Peter Senge, author of *The Fifth Discipline* and co-author of the recently released *The Fifth Discipline Fieldbook*, will discuss new ways of thinking and managing that have allowed their organizations to thrive.

You will hear how you can:

- Change your "mental model"
- Learn how to facilitate communications and "share" information with every individual in the corporation
- Understand your personality type and how it affects your business transactions
- Apply a variety of non-traditional management practices
- Use electronic marketing delivery systems and investigate the sociopathological issues of the Internet

"Rarely does sharing information change mental models and lead to fundamental improvement in business operations," says Peter Senge. CIOs need to learn that sharing actionable information can lead to increased success in business.

Dr. Jim Wetherbe, Director, MIS Research Center, University of Minnesota, and Federal Express Professor of Excellence and Director, Center for Cycle Time Research, University of Memphis, will again moderate the *CIO Perspectives* program and set the stage for our discussions.

So join us, October 15–18, in Orlando and learn how to adapt to a rapidly changing business climate in an environment where technology's advances are measured in weeks, not years.

COMPANION PROGRAM

Participation in the companion program includes all scheduled receptions, meals and entertainment. Companions must be enrolled in the program for involvement in any conference-related activities. The companion program does not include conference session attendance.

PROFESSIONAL SESSIONS

On Monday afternoon, for those of you who do not play golf or tennis, there will be several professional sessions available. There is no additional fee for these sessions.

FEATURED PRESENTERS

JERRY MACDAID
CEO
Center for Applications of Psychological Type

R. TIMOTHY EPPS
Vice President of People Systems
Saturn Corporation

WILL PAPE
CIO
VeriFone, Inc.

PATRICK J. ZILVITIS
Vice President
Corporate Information Technology
The Gillette Company

DON PEPPERS
President
Marketing 1:1

FRANK POLLARD
Senior Vice President & CIO
Allstate Insurance Company

MICHAEL RADCLIFF
Vice President & CIO
Owens-Corning Fiberglass

EINAR STEFFERUD
Chief Visionary
First Virtual Holdings Inc.

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The Psychology of IT: The CIO's New Mind Set

Sunday, October 15–Wednesday, October 18, 1995
Hyatt Grand Cypress ■ Orlando, Florida

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advocates testing.

Lastly, employees themselves, concerned about layoffs and looking to increase their employability, are signing up for certification programs and taking exams—with or without corporate sponsorship. "In fact, 12 percent of all the people who take the IT tests that we offer are unemployed," says Alan W. Hupp, vice president of marketing for Drake Prometric, a computer-based testing company in Bloomington, Minn.

To those in the testing industry, computerized testing is a revolution in progress. Without an entrenched portfolio of paper-based tests, the IT industry had the luxury of building computer-based tests from scratch. "But it has taken the rest of us, including the test-development experts, some time to become familiar and comfortable with the technology," says Marc Waldeck, director of business development for Sylvan Learning Systems Inc., an organization in Columbia, Md., that administers tests for the Educational Testing Service (ETS) in 170 countries. And the benefits of this revolution are just beginning to be realized, says Ernest Anastasio, executive vice president of information systems and technology for ETS, the Princeton, N.J., nonprofit organization that runs the college placement tests including the SAT, GRE and GMAT.

Waldeck explains. "Before, test takers had to register a month in advance, get herded together in a room to take the test and then wait a month for the results," he says. "Now, you register for and take the test at your convenience, pick up your results and get feedback for further areas of study on the way out the door."

Most organizations that invest in testing and certification programs pay a testing company to administer their exams in secure sites around the globe. For these organizations, the benefits are no less significant. For one thing, security is much better, as tests that used to be stored in a safe are now guarded by encryption. With the pencil-based tests no longer hogging the mainframe, aggregate test results are more accurate and are available immediately. And because tests are retained in electronic form, no longer needing to be printed in massive numbers, questions can be changed quickly and inexpensively, making it harder for test takers to "beat" the test. Finally, using international networks, organizations can now consistently offer the same tests on demand around the globe.

Even when the computer test does not replace a paper version, the savings can be big.

The cost savings to be gained can also be considerable. "By removing all 67 of our written tests, we are saving $7.05 in administration costs per test, for a projected annual savings of $1.4 million," says Eldon Beavers, program manager for computerized airmen testing for the FAA Aeronautical Center in Oklahoma City.

Even when the computer test does not replace a paper version, the savings can be big. For example, Drake Prometric administers computer-based tests for in-house hardware-repair technicians at Aetna Life and Casualty in Hartford, Conn. The testing program "pays for itself many times over," says Karen Kocher, Aetna's senior administrator for IT education and training. In addition to lower hardware-repair bills (there's less need to call on outside repair people, and equipment life is longer as a result of better maintenance), employee morale and efficiency have improved, says Kocher. So successful is the program that Aetna gives employees incentives such as cash bonuses for passing exams.

Indeed, computerized tests should not be simply electronic versions of their paper-based predecessors. "If all we were doing was implementing the linear tests on a computer, then computer-based testing wouldn't be worth doing," says Anastasio of ETS. Rather, computers change the very nature of test taking, spawning a variety of innovative new techniques.

One such advance is "adaptive" testing, in which the test itself adapts and changes shape as the taker answers each question. If the examinee answers the first question correctly, for example, then the computer serves up a more difficult question as the second one; if he or she answers the first incorrectly, then an easier one is asked next. This process continues until the test taker's competency—or lack thereof—is determined. Smart test takers can spend as little as half the standard time taking the test, since they progress through the difficulty levels more quickly, while less-competent candidates must spend longer.

Another development is performance-based testing, in which candidates must solve on-the-job problems. Some banks, for example, now test job candidates' abilities to serve customers and handle problems by running them through a computerized "dry run" of the teller's job. And ETS is now in the process of building a performance-based test for architects that would have them use the CAD tools of their trade to solve real-world design problems.

Computerized tests are not perfect, however, and executives considering the technology must be wary. A bad test instrument is still a bad test instrument, whether on a computer or not. And until technology offers ways to verify who exactly is sitting down in front of the computer, real, live proctors will continue to be needed to monitor the tests.

Finally, keep in mind the largest and sometimes most subtle danger: Some testing and certification programs are really just sophisticated marketing tools and revenue sources for their vendors. For example, according to one test designer, Microsoft's Roadmap certification program requires that takers of a word-processing test also be tested on other Microsoft products, which may have no relevance to the word-processing skill assessment. "Tests need to be oriented to the user, not the vendor," she warns. The message? Don't stop testing the tests.

CAPITAL ASSETS

Financial services firms live and die by their information, so it's not surprising that IT is everywhere. Today, new technologies are providing a wealth of new opportunities—as well as their share of challenges.

BY MEGAN SANTOSUS

Without sophisticated IT, the financial industry as we know it would not exist. In the financial world, global market activities never stop, opportunities are fleeting and responses must be instantaneous. Technology is responsible for creating that situation, and it's also the only way for financial firms to survive. Having long been pioneers in adopting new technologies, these companies are continuing that trend today at a stepped-up pace as they try to manage ever more data from around the globe with increasing speed.

"Financial services respond far more quickly to new technologies than other industries simply because systems can allow a lot of people to do their jobs better and make money faster," says Bonnie Cox, a senior consultant specializing in financial systems and investment services at Goldstein Golub Kessler & Co. P.C., an accounting and consulting firm in New York. "Brokerage firms have always been among the first to latch on to new technologies because the business benefit—namely, an increase in volume—is easy to understand."

On a typical trading day, the far-flung offices of a global financial services firm will handle millions of transactions in different currencies and under different market conditions. The ability to conduct this volume of business with speed and accuracy requires the serious computing power of mainframes, the desktop capabilities of client/server systems and the flexibility of handheld devices. Since most such firms operate around the clock, data from multiple sources must be constantly updated and made available to decision makers; at the same time, firms must be able to keep tabs on the risks posed both to them and to their customers. Global networks can certainly link disparate operations, but the real challenge for worldwide firms is to turn raw data into meaningful information that people can use to drive their business decisions. Client/server architectures, data warehouses and decision-support systems are often a means to that end.

The Chicago Board Options Exchange (CBOE), for example, trades options on more than 600 equities listed on exchanges in the United States, Mexico, Israel and Japan. On any given business day, an average of 300 transactions occur every second. In 1994, nearly 184 million contracts were settled on the CBOE's trading floor, accounting for 65 percent of the total options market in the United States. Without significant computing horsepower, such volume would be impossible.

A three-tiered client/server-based architecture consisting of a mainframe, communications servers and PC clients provides the muscle behind trading operations. And then there are the wireless handheld PCs with touch screens, Token Ring LANs, 2,400 overhead monitors, 4,500 trading terminals, 4,060 telephone lines and about 50,000 miles of wiring and cables. As Senior Vice President and de facto CIO Gerry O'Connell sees it, all of this hardware is a competitive necessity because customers want their orders processed quickly.

Indeed, speed and the ability to gather and process huge volumes of information accurately are the name of the game. "The need to integrate data from all kinds of disparate sources and systems is happening throughout the financial services industry," says Cox.

PHOTO BY MATT GILSON

GERRY O'CONNELL: *"We now have to consider things such as intelligent routers and firewalls that normally wouldn't be part of a project."*

STEVE SCULLEN: *"We want to be able to evaluate both our customers' risk to us and their risk in terms of their overall exposure to the marketplace."*

Suppose a global securities firm needs to collect market data from trading operations in Indonesia and Singapore, combine it with data in Hong Kong and send it to New York. Delays or errors at any point in the process can cost the firm millions of dollars.

According to James G. Raney Jr., a partner at Coopers & Lybrand LLP consulting in New York, technologies such as client/server, object-oriented systems and data warehousing are the "hot areas" in financial services, with investment banks, brokerage firms and other organizations involved in capital markets usually leading the way. There's more money to be made on the trading side, and the speed with which decisions have to be made dictates using advanced technology.

"Globalization in the trading environment is really driving client/server because real-time information from many different sources is critical," Raney says. "Whether we call it client/server, open systems or scalability, the laboratories for all that technology are trading floors."

With offices located around the world, firms are turning to client/server-based networks to link traders and provide them with data that's quality controlled and accurate. "Traders rely on timely data and real-time pricing at their fingertips, and the only way to do that is with open technology," Raney says.

In Raney's opinion, retail financial firms that deal primarily with individual consumers lag behind the advanced technology curve. In the retail sector of the financial services industry, many bottom-line benefits are achieved by improving productivity with back-office technology such as imaging and workflow applications. Other retail systems such as ATMs or touch-tone applications have to be designed in such a way that consumers will be comfortable using them. Traders, on the other hand, are quick to adapt to leading-edge technology if it will give them an edge over the competition or help them exploit a market niche.

That's not to say that retail companies are in the Dark Ages when it comes to technology. "Retail and consumer-based companies are trying to mine the information they have about customers," says John Karr, a partner with Ernst & Young's financial services industries management-consulting practice in New York. "They are creating integrated information capabilities and using analytical modeling tools to get a comprehensive understanding of their markets."

For example, product managers in the marketing department at T. Rowe Price Associates use a query and reporting tool from Business Objects Inc. to access from their desktops corporate information stored in SQL databases. The users track advertisements for retail products such as mutual funds and annuities and analyze sales that come in as a result. Each ad corresponds to a different 800 number, so phone sales are linked to a specific campaign.

According to Tim Hudner, vice president of retail systems for the Baltimore-based brokerage firm, managers now perform their own analyses and can—if need be—change ad campaigns on the fly. "Their ability to track ad sales gives them a better sense of our markets, while it frees IS from querying and reporting," Hudner says. As a result, productivity is up for everyone involved.

Whether financial firms serve commercial or retail markets, collecting information about customers is critical, not just for marketing purposes but also to assess the risk a company—and its customers—face. As the Orange County, Calif., bankruptcy and the collapse of Barings PLC showed, the ability to manage risk—whether it relates to regulatory compliance, creditworthiness or market volatility—has never been more important.

That's especially true for global companies that offer a variety of complicated financial products and are exposed to widely divergent investment conditions around the world. The solution often involves standardizing information in a data warehouse in conjunction with client/server-based architectures. Object-oriented technology often comes into play when end users require real-time access to accurate information. Along the way, the technology may result in productivity improvements or reduced costs, but the real payoff is ensuring that firms don't lose their shirts.

PHOTO BY JULIE HOUCK

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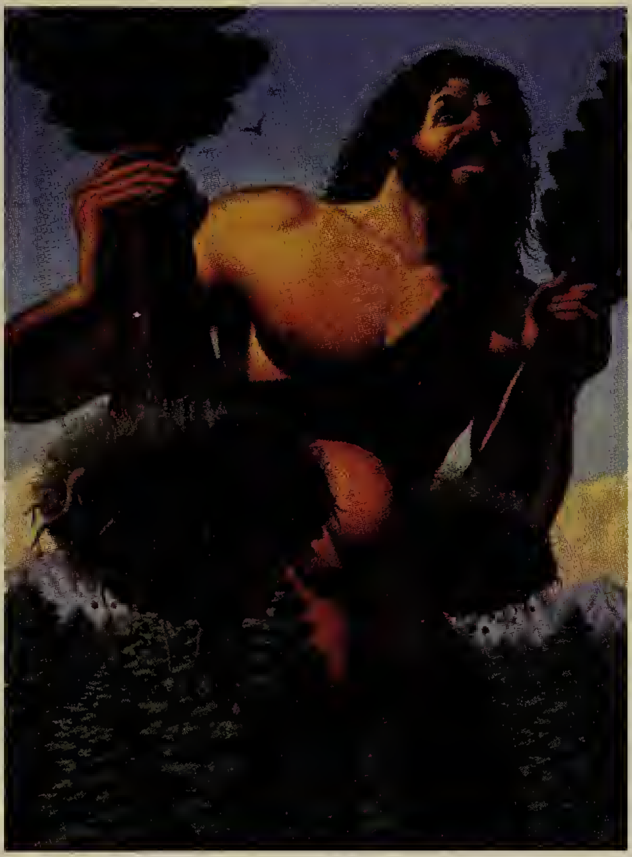

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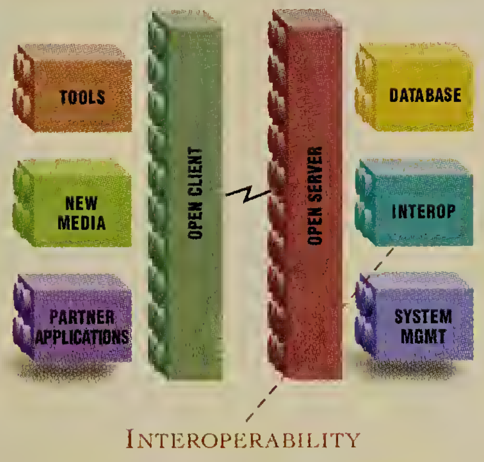

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At CoreStates Bank in Philadelphia, for example, object technology enables users assessing risk to access information from a centralized data warehouse without the intervention of IS personnel. For the decision-support front end of its retail credit risk information system (RCRIS), CoreStates opted for SAS Institute's object-based SAS System, which enables end users to access the data warehouse in a DB2 environment on an IBM 3090. By providing users with objects to access and present data, SAS enables them to access and manipulate the information they need, freeing the IS staff to spend more time on maintaining legacy systems and developing client/server projects. SAS is also used to create models or perform analyses on the desktop.

The First National Bank of Boston's treasury business group sells a range of products including derivatives and fixed-income investments to customers around the globe. "We want to be able to evaluate both our customers' risk to us and their risk in terms of their overall exposure to the marketplace," explains Steve Scullen, the director of treasury systems at the bank's Boston headquarters. For example, a customer may be dealing with the bank's trading groups in North and South America and have both foreign-exchange and interest-rate swap contracts. Instead of assessing the risk of each contract individually, the bank wanted to look at the risk of contracts collectively. The only way to do that was to build an integrated architecture that allows traders and analysts to view a customer's entire relationship with the bank, whether it's across borders or product lines.

In 1994, the bank began the migration to a client/server environment that includes Unix-based Sun machines, TCP/IP LANs, and both Sun and Novell servers. A dedicated WAN connects the bank's five major trading operations around the world. A Sybase database engine is used for both the trade-entry and risk-management systems. The risk-management system is now in place in Boston and enables traders to simulate deals before they are transacted. The bank is rolling out the risk-management capability in Boston on a product-by-product basis and hopes to roll it out to global sites by the end of 1996.

JEFF OULTON: *"We have three sets of users who have distinctly different needs, but we didn't want to train people to use multiple tools."*

PHOTO BY EUGENE MOPSIK

Suppose a Bank of Boston trader in Sao Paulo has struck a deal for a foreign-exchange contract with a customer. The trader will enter the deal into the trade-entry system, where it will be priced so that the trader knows the exact exposure to risk in the exchange market. As the deal is entered, the risk position to both the bank and the customer will be calculated.

"Before, we would only become aware of risk the following day, when accounting reports were updated," says Scullen. "We've reduced errors with the system because data does not have to be manually entered well after the trade and we can identify the risk of all positions upfront."

The risk-management system uses a series of mathematical formulas to calculate the risk depending on the types of deals, currencies and country-specific conditions. Once databases in Sao Paulo and Boston are linked, the data will be available simultaneously in both locations.

Jeff Oulton, vice president of retail risk analysis, forecasting and technology for CoreStates, heads up risk management for retail banking operations. His group uses modeling systems to assess various kinds of risk related to loan transactions such as credit lines and collection terms. With 12 different mainframe environments and data files in a variety of applications such as Lotus 1-2-3, Oulton's group had to bring everything together in a data warehouse and develop an analytic tool that enables users to sift through the data for reporting purposes.

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INSTRUMENTS

Indeed, integrating data from a wide variety of sources is one of the principal challenges many financial firms face. According to Oulton, the most difficult part of the project has been trying to standardize data in a data warehouse. For example, two different loan-application processing systems identified the same credit product differently—one used a five-character alphanumeric field; the other, a three-digit numeric field. As a result, CoreStates has implemented a "data interrogation" process that requires users to notify everyone when adding a new product code into the database. "This has been a real challenge for the users," Oulton admits, "because they may have to wait a bit before they can make changes."

When firms have diversified business units, integration becomes all the more difficult. At Chase Manhattan Bank, for example, data warehousing and decision-support systems are critical to several of the firm's divisions, including worldwide import and export finance, global trading and credit card operations. To integrate and manage various systems around the world, Chase adheres to a strict standards-based approach. "We've had a corporate data architecture in place for some years now," says Jonathan Vaughan, the vice president of applied technology at Chase's data center in Brooklyn, N.Y. Sybase is the standard LAN database because it is scalable from desktops and servers to the massively parallel system used by credit card operations.

In a global environment, reconciling data integrated from a variety of sources can be a particularly difficult proposition because of differing time zones. When everything was processed on a single mainframe, time was moot in that it was easy to determine the order of transactions and how they related to one another. As data is distributed and replicated across time zones, it can be difficult to determine the correct sequence of transactions because today is already tomorrow in Japan. "If you look at a portfolio from a global perspective," says Vaughan, "dates have to be recorded so that the real time sequence of events can be re-created." Otherwise, figuring out the correct total in a business report can be a monumental undertaking.

However financial firms decide to integrate their dispersed data and systems, the fact remains that users must deal with the result. In addition to any potential technical difficulties,

JONATHAN VAUGHAN: *"The first simplistic assumption is that every user would want the most powerful tool possible."*

Leading the Market

At Nike Securities LP, serving the customer includes supporting its systems

If you think supporting your own creaky legacy systems is difficult, imagine what Jerry Conner's job must be like. As the director of information services at Nike Securities LP, a 4-year-old financial services firm in Lisle, Ill., Conner doesn't have to worry about internal legacy systems. It's the legacy systems of many of Nike's customers that keep Conner busy.

Nike is in the wholesale business of selling investment products to brokers and dealers that in turn offer them to individual investors. The company is in the process of implementing a client/server-based architecture built around a standardized Sybase system. Currently, a back-office computing system that handles order-processing and accounting applications is up and running, including SQL Server installed on HP 9000 machines. Next, Conner hopes to distribute the information from the back-office system to the desktops of employees. Ultimately, Nike plans to provide customers with online access to financial product information.

PHOTO (LEFT) BY KENT HANSON; PHOTO (RIGHT) BY MATT GILSON

According to Conner, many of Nike's competitors in the asset-management and capital-markets business distribute information to their broker/ dealer customers with technology that's 10 years old. "Typically, their systems work in much the same way as CompuServe," Conner asserts. "People use a dumb terminal to dial in and make inquiries and get a file printout at their desks."

Moving to a client/server system will allow Nike to establish sophisticated links with its customers. "We'd like to have ISDN-type connections so our customers can access our network but do the processing on their own machines," Conner says. Customers could get timely information regarding portfolios, historical prices and products. Eventually, Conner hopes that customers will be able to place their orders from their desktops instead of phoning them in. As a result, the order process will be quicker and the chance of mistakes will be minimized, according to Conner.

JERRY CONNER: *tighter customer links*

Among Nike's customers are broker/dealer firms such as AG Edwards and Kemper Securities. While some customers have very sophisticated internal systems, others are far from the cutting edge. "It's really a mixed bag as far as systems go," says Conner. "Some of our customers can link with our client/server environment, but others still operate in practically an XT mode where client/server won't run." As a result, Nike will have to continue supporting those that still use dial-in and dumb terminals.

But Conner remains optimistic that customers will eventually adopt newer technologies. "Hopefully, we will offer enough features and benefits to convince them to invest in technology that will let them get information quicker."

–M. Santosus

individual preferences and susceptibility to information overload are important factors for IS to take into consideration when designing and implementing systems.

For example, Chase developed a three-tiered client/server architecture consisting of layers for presentation, business logic and data management. The overriding goal of the various client/server initiatives is to enable Chase to get a complete picture of customers and their relationships with different operations. "In this way, we can add value to the information that we already have and improve customer service," Vaughan contends. To accommodate a diverse end-user population, customized decision-support systems and tools such as Powersoft Corp.'s PowerBuilder and Microsoft Corp.'s Excel allow a range of users to access information either through ad hoc or structured queries. "The first simplistic assumption is that every user would want the most powerful tool possible," Vaughan says. "We've found that there are classes of users who need a more structured environment in order to view data more effectively."

At CoreStates, "we have three sets of users who have distinctly different needs, but we didn't want to train people to use multiple tools," Oulton says. Executives generally want summarized data that they can drill down into for further detail. Analysts are essentially power users who are comfortable with ad hoc tools. And then there's a level in between, who may start with summarized data but eventually migrate to ad hoc query tools. The SAS front end allows each type of user to get data with the detail level they need. Although still in development, CoreStates' client/server-based system is expected to be rolled out to 100 users by the end of 1995.

When it comes to combating information overload, the Bank of Boston has found that filtering capabilities are an effective weapon. "Technology does allow you to offer people a deluge of information, so we're trying to build in some flexibility so traders can look at what's relevant to them," says Scullen. One tool being used on the trading floor is Panorama, a screen-management application from IXI Corp. that helps filter information. Using it, an exchange trader dealing in German marks and Japanese yen, for example, can quickly flip between screens displaying relevant information rather than having to weed through data on the dollar or the British pound.

The CBOE, meanwhile, is implementing a system that will allow traders on the floor to reconfigure their screens to display only the information they need, including market data from other exchanges. Right now, traders are responsible for keeping tabs on market information even though it's not displayed continuously. "With the new system, traders will be able to paste important data on a screen that will be updated constantly," says O'Connell, enabling a much more efficient use of screen space.

Finally, as in most information-dependent industries, security has become a top concern. At the CBOE, for instance, O'Connell now has to contend with security issues that were nonexistent when the exchange relied on leased lines with industry-specific protocols that were difficult to tap. Open-systems technology—in particular Unix, TCP/IP and Internet access—can leave the exchange vulnerable. Today, particular attention is paid to ensuring that paths for receiving and sending data are duplicated in a client/server environment. In addition, says O'Connell, "we now have to consider things such as intelligent routers and firewalls that normally wouldn't be part of a project."

Nevertheless, in an industry that lives and dies by its information, no one disputes that such additional efforts are worthwhile.

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The scope of Brigham and Women's Hospital's whole-enterprise, client/server systems overhaul was unprecedented in 1989. But careful planning, a strong architecture and sound management techniques have produced bottom-line paybacks for the Boston institution.

A Successful Operation

BY RICHARD PASTORE

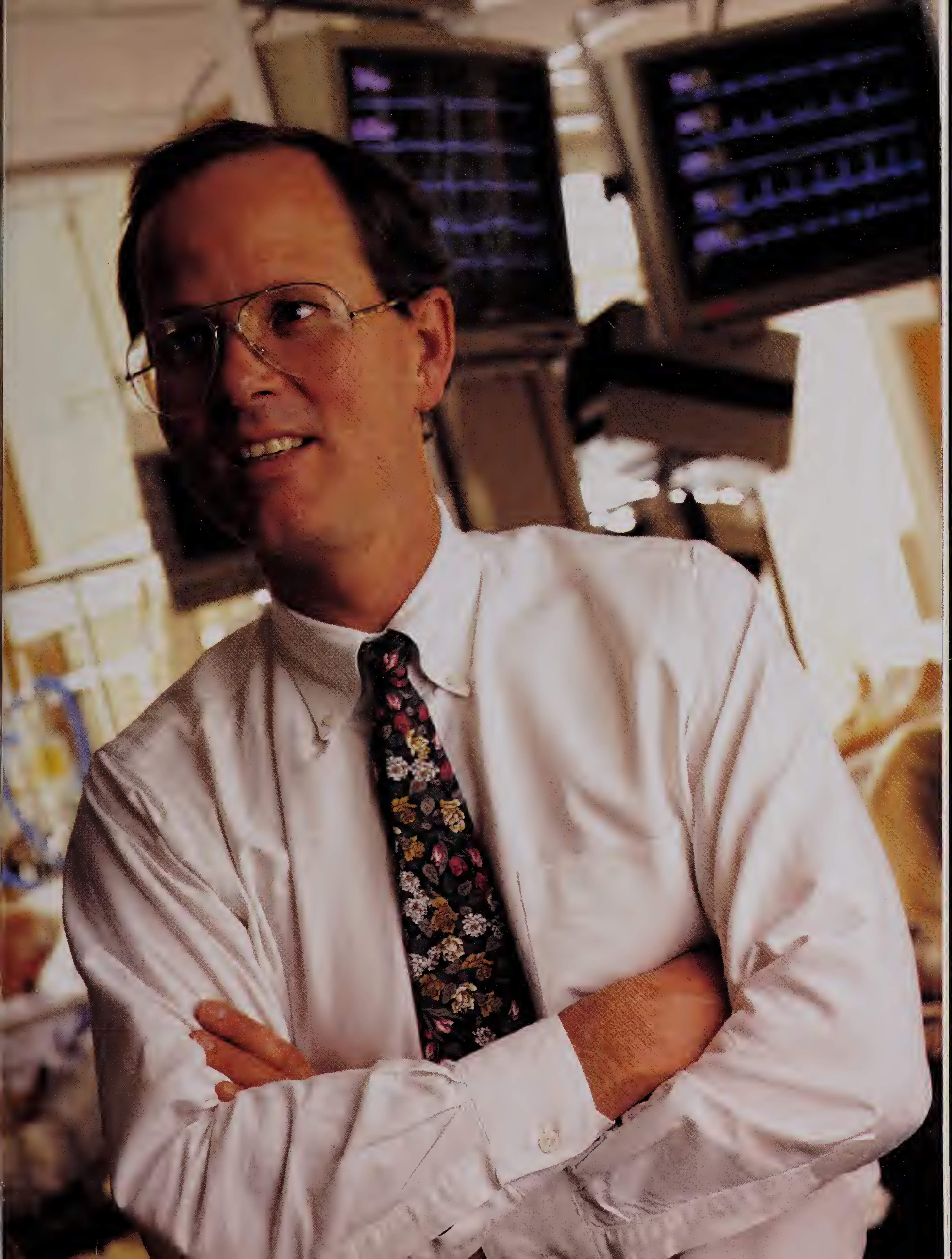
JOHN GLASER PEERS across the podium at a sea of skeptics assembled for a recent health-care IT conference. With just 24 color transparencies and one hour, the Brigham and Women's Hospital IS director hopes to persuade his peers that an industrial-strength client/server network running 90 major applications and linking 4,200 clients and 7,300 users enterprisewide is possible. He knows what they are thinking. It's a budget buster. The throughput isn't there. You can't manage it. Such doubts are understandable from CIOs, the biggest critics of client/server hyperbole.

In 1989, executives at Boston-based Brigham were similarly unsure that the technology could solve their problems and meet their needs. But six years and several lessons later, they have their proof. The Brigham staff now know that client/server is neither a panacea nor a weak-kneed mainframe substitute. Its successful implementation hinges more on good management techniques and architecture design than on the technology itself.

But back in 1989, for all they knew, no one in health care or elsewhere had ever pulled off such a large-scale system. There was no one to compare notes with or derive comfort from, says Jay B. Pieper, senior vice

JOHN GLASER *presided over Brigham and Women's ground-breaking, enterprisewide client/server migration. At the time, there were no models to follow.*

PHOTO BY WEBB CHAPPELL



A "DROP-DEAD GROUP" OF EXPERT ADVISERS FOUND 14 RISK FACTORS THAT COULD STOP THE PROJECT COLD. BUT THERE WAS NO WAY TO ANTICIPATE AND PREPARE FOR EVERY POSSIBLE RISK.

president, CFO and Glaser's boss. But the opportunities represented by the technology overrode fear of the untried, and a small nucleus of decision makers—Pieper, Glaser and then-CEO Dr. H. Richard Nesson—chose to pursue client/server as their new enterprisewide platform.

The technology was the apparent alternative to the existing Data General minicomputer platform, which was nearly maxed out in capacity. Brigham needed greater scalability and power to run the next wave of compute-intensive clinical applications that were becoming de rigueur for 1990s health care: systems able to retain all clinical data for every patient record, to advise physicians on possible diagnoses and treatments, and to automatically scan for and alert clinicians to potential patient-threatening events. The hospital also wanted to add access for the growing number of clinicians who treat outpatients off campus. (See "Uncertain Diagnosis," CIO, May 1, 1994.)

Brigham's executive trio discussed their client/server notions with outside experts, including such academic luminaries as Jim Cash, chairman of the M.B.A. program at Harvard Business School. Seven reviews took place, with business and technology experts expounding on the scheme's chances for success. They agreed that client/server was the way to go, "but they challenged the coherence of our thinking," Glaser notes. A "drop-dead group" of expert advisers found 14 risk factors that could stop the project cold. But there was no way to anticipate and prepare for every possible risk. The alternative, the experts suggested, was to approach the client/server migration like a research and development project.

R&D endeavors and other projects with high risk factors do not lend themselves to precise PERT charts and timetables. "If you have all these deadlines and timetables and you go wrong, your credibility goes walking out the door," Glaser says. Instead, the Brigham team agreed to take a less precise approach, in which it didn't matter as much if they ran into trouble as long as they had some idea of how to extricate themselves. For example, if throughput turned out to be inadequate, they could run applications on a Digital Equipment Corp. VAXcluster. "That's an example of an exit path that preserved some of the investment," Glaser says.

JAY PIEPER: *"We resisted throwing all our resources at the new platform just to make a date."*

PHOTO BY WEBB CHAPPELL

The Plan

The input of the outside experts and the executive commitment set the stage for initial planning. A project of this scope and duration begs division into shorter, less intimidating stages. Glaser conceived three phas-

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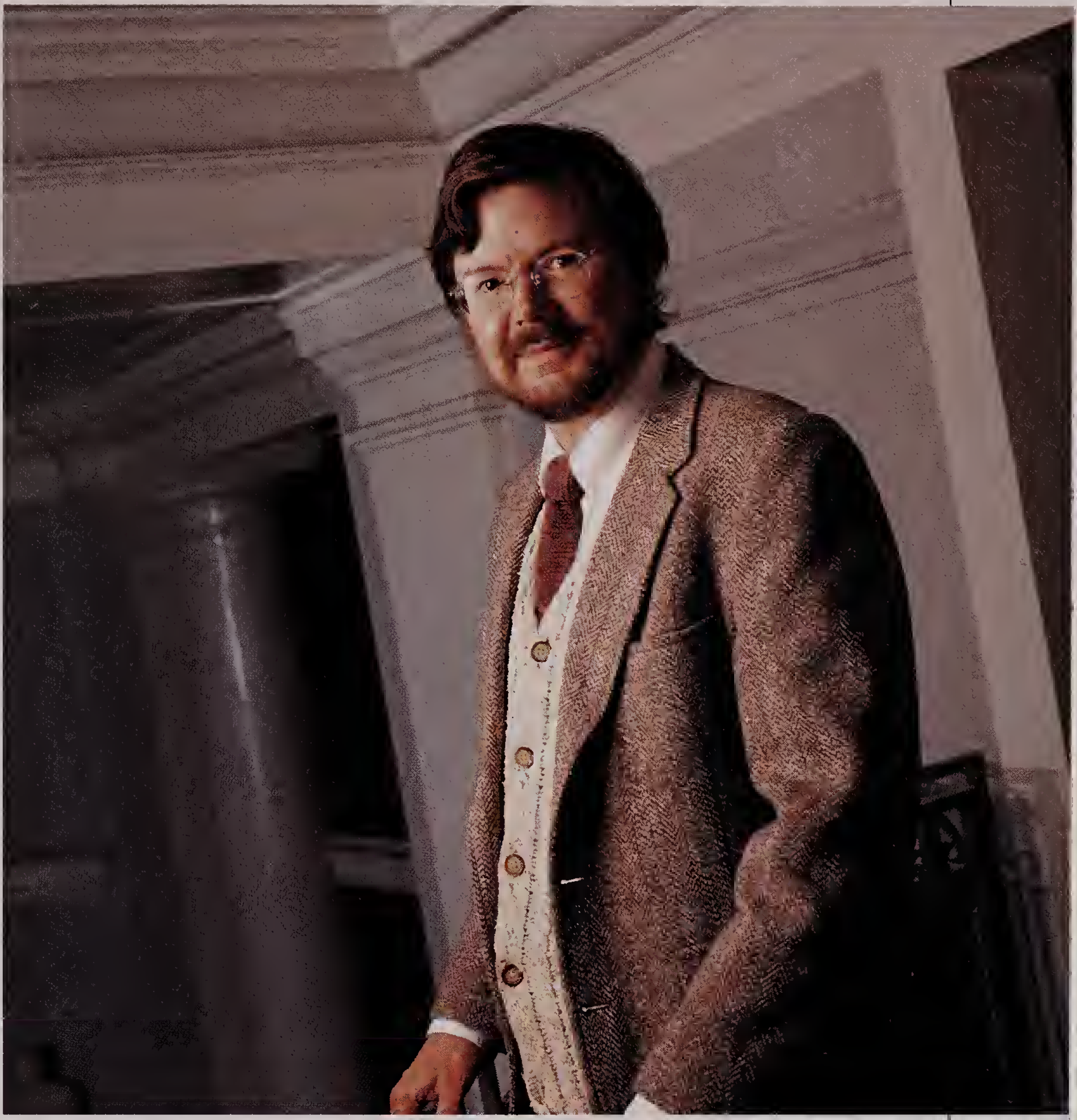
es: analysis and prototyping, limited deployment and full conversion. Each phase was further subdivided. "John was good at providing shorter, reachable milestones," says Robert Beckley, director of technology planning. Focusing several years out on a 4,200-node network would have been a mistake. "We looked ahead at a two-week span."

The basic stipulations for the migration process were zero tolerance for downtime—an obvious necessity in a hospital setting—and that the project could not jeopardize current IT operations and ongoing development. "We insisted on leaving IS people free to work on advances in existing systems and resisted the temptation to throw all resources at the new platform just to make a date," Pieper says.

In fact, legacy systems were updated right up until a few months before their scheduled conversions. The Data General minis were also upgraded. "It was important to meet existing needs, and we doubled the size of the minis and added capability during new-platform development," Beckley says. But there was still considerable pressure to finish the job—any additional users on the minis would have crippled the system and affected services. "If we had missed [our revised deadline] by a year, it would have been catastrophic."



ROBERT BECKLEY: *"If we had missed our revised deadline by a year, it would have been catastrophic."*

PHOTO BY JAY REED

Beckley was part of a four-person team assigned to develop crucial enhancements to Open M, an integrated database-management and application-development environment from InterSystems Corp. of Cambridge, Mass. The team's goal was to allow the then-limited Open M to accommodate hundreds of servers and thousands of nodes while managing data-cache integrity. Though larger numbers of staff would work on the desktop environment, new applications and application conversions, Glaser wanted this core development team to be small.

"Bold change doesn't come out of committees," Glaser contends. A small number works best, provided the talent is top flight and the members have a deep mutual respect and interdependency. Glaser co-located the hospital and InterSystems team members and managed them with care. "You need good antennae to know how they are getting along. Their egos are not trivial, and you need to feed them like a coal-burning engine on a train."

Staff clinicians and administrators were also integral to the plan, offering input on their needs and desired functionality. "The involvement of clinicians in building this was intense," says Dr. Anthony Komaroff, director of general medicine and primary care. Accordingly, there were no painful surprises when the systems went live because they had been "checked out by demanding physicians." In a very real sense, they were just what the doctors ordered.

"I've been one of the people involved since day one," says Christine Collins, director of patient access services. Collins' chief concerns were user-friendliness and data integrity, both of which have been addressed in the new platform. Known around the hospital as one of the most successful administrative managers in getting what she wants from IS, Collins proffers this advice: "Users need to

> "WE MAKE CLIENT/SERVER SOUND SO DETERMINISTIC—THAT YOU HAVE TO EMPOWER END USERS AND GO WITH A GUI—BUT THAT'S A MANAGER'S CALL."
>
> *–John Glaser*

understand what they want; they need to do research and benchmark. Before you ask someone to program something, you should understand the flow of the process and how it would be done manually. And the user needs to follow through with the systems request 100 percent. Don't let IS run away with it."

Several architecture decisions made in the planning phase contributed immeasurably to the eventual success of the project. Homogeneity was the first. The servers and nodes would all be Intel Corp.-based PCs. Open M would handle the database-server chores while Novell Inc. NetWare would take care of the desktop applications. This relative homogeneity would make network management far easier than in architectures with multiple operating systems and protocols and multiple vendors' databases (see related story, Page 52).

The choice of Open M also enabled an easy conversion of existing applications. A utility existed that would automatically translate all systems from the current Meditech MIIS operating system to Open M. IS originally tried reengineering applications, but after six months of that, they realized it would take the rest of the decade to finish. They wisely switched to the translator.

Glaser made some unconventional choices about user empowerment and graphical interfaces. He didn't want much to do with either. "We make client/server sound so deterministic—that you have to empower end users and go with a GUI—but that's a manager's call," he contends. The bulk of the users, particularly those with heads-down tasks, did not need "empowerment"—floppy drives and end-user development tools. Similarly, for many of the hospital's applications, GUIs are irrelevant. "It depends on how you want to use your processing, but GUIs can use up a lot of your capability."

The Migration

Client/server skills are still a coveted commodity, but six years ago they were as rare as on-time product releases. Brigham's systems software people had to pick up the skills as they developed Open M. Programmers had to learn how to partition an application across the network, and they faced a steep learning curve with GUI tools and event-driven development. Systems operators needed to master the complexity of configuring network machines.

A portion of the staff attended "client/server school," but as often happens, few got to apply that training until trouble hit. "Then there would be a lot of stumbling around and 'Three Stooges Syndrome,'" Glaser says. Overall, it took longer for IS to become a well-oiled client/server machine than he would have liked.

The biggest delay factor, however, was the need to balance resources between the migration and maintaining and enhancing existing operations. IS consciously made the project late in order to put out fires and avoid adding staff. Glaser admits it was difficult to know how hard to push the accelerator in the drive to get the job done. The systems suffered a month of instability

How to Win Friends and Influence CFOs

Presenting a convincing case for IT investment is a fine art. Jay B. Pieper, Brigham and Women's senior vice president and CFO, has the following advice for CIOs who want to brush up on their skills.

"You need to relate technology issues to business issues, but to do that you need a boss who relates the business issues to you. When you sit in a closet, how are you supposed to know? If the CFO doesn't voluntarily provide this information, then the CIO should consider it necessary to extract that information. If it's not the CFO's highest priority, then get it elsewhere in the organization.

"Where CIOs often go wrong is not including in their thinking all the cost components. CFOs aren't forgiving when you give two-thirds of the story. You need to include capital costs and ongoing operating expense, and you must really be concerned about maintenance and service (including training and helping the user after the system is installed). It's a more important concern in client/server because these costs are more extensively incurred outside the glass house. IS needs to go beyond the wall to provide that, so it's easier to understate it badly.

"It's also important to be thoughtful about internal controls that assure people of the data's integrity. In client/server, you'll split databases and permit similar databases to be used independently. Tell CFOs how you will keep that data under control. If you just let us imagine it, you're likely to come up negative."

when IS converted more applications than the operating system was ready to handle. The new physicians' order-entry application in particular taxed the network with its surprisingly high transaction demand. At the same time, IS was contending with client rollouts that more than doubled the total number annually, from 720 nodes in 1992 to 1,700 in 1993 to 3,900 by the end of 1994.

In the end, Brigham missed its deadline three times. "In 1989, we estimated we'd be done at the end of 1992—but what the hell did we know then?" Glaser says. The date changed to the end of 1993, then to late 1994. The final major application conversion actually took place in early spring 1995.

Cost projections were more on target. The current amortized capital cost per node is \$3,500, while the projected cost was \$3,100. Cumulative capital costs for the new platform reached \$11 million, but that included normal growth of the institution.

The new platform could have decreased operating costs (though that was not one of its objectives). But that was offset by IS staff increases necessitated by the facility's growth. Though overall IS staffing has doubled to 92, the computer-room count of operators is the same as it was seven years ago. Glaser says that if care hadn't been taken to avoid a heterogeneous architecture, the overuse of GUIs and unwarranted end-user empowerment, staffing costs easily could have gotten out of hand.

DR. ANTHONY KOMAROFF: *The hospital would be crippled without the new platform.*

PHOTO BY JAY REED

The Results

Cost comparisons are among the chief indicators of the platform's success. Similarly sized hospitals spend 25 to 50 percent more operating their systems than does Brigham and Women's, according to Pieper. The CFO admits to the difficulty of quantifying a payback for a project like the platform conversion. "Our growth has come without adding [hospital staff], and that productivity enhancement is in part permitted by the systems," he notes. But since the computing costs Brigham less than it does competitors, "I don't want to even invest in figuring out a more precise ROI." Instead, Pieper prefers to evaluate the platform by what the users think of it.

Brigham's system is well respected in the industry, and the institution has achieved a head start on the distributed computing path that most hospitals are now following, according to John Page, executive director of the Healthcare Information and Management Systems Society in Chicago. But Page agrees that regardless of the technology, the platform's success hinges on satisfying users, who can be a tough lot to please in health care.

If user opinion and usage rates are a bell-

SIMILARLY SIZED HOSPITALS SPEND 25 TO 50 PERCENT MORE OPERATING THEIR SYSTEMS THAN DOES BRIGHAM AND WOMEN'S, ACCORDING TO PIEPER.

BRIGHAM IS CURRENTLY MERGING WITH BOSTON'S MASSACHUSETTS GENERAL HOSPITAL, CREATING THE STATE'S THIRD-LARGEST EMPLOYER AND ONE OF THE COUNTRY'S LARGEST HEALTH-CARE PROVIDERS.

wether of success, then Brigham's client/server platform is a keeper. "It would be impossible to function without it," physician Komaroff says. Electronic medical records, test results, notes from visits and hospitalization summaries are all accessible from any one of 4,200 terminals and via dial-up. E-mail, too, has become integral to physicians' daily practice. On call over the weekend, Komaroff might see 10 patients under the care of his colleagues. "In most of the rest of the world, I'd have to write notes to my colleagues to update them. Here, I type a note in the patient's electronic record, hit a hot key, and it's e-mailed to the physician."

The platform's cross-departmental electronic records make a difference in patient care and costs as well. Searching for paper records created across the enterprise is such a horrendous consumer of clinicians' time that it can impair the quality of care and drive up costs. "If I want to know if a patient had a particular blood test done, I'd have to find a chart and flip through every page," Komaroff says. "I'm not going to be as careful if it's 3 a.m. and I have three very sick patients. I might chuck it and order the test to be done again."

The platform also allows administrators to improve service to patients and families. A surgical liaison system for scheduling procedures across 34 operating rooms records date and time of patient operations, expected arrival time in recovery rooms, whether the patient brought in a coat, how many suitcases, etc. It also keeps tabs on where the patient's family is waiting, how long they've been there or whether they need to be telephoned at home or work. These details allow admitting staff to provide anxious family members and friends with prompt answers, efficient service

Taming the Beast

The key to effective network management is to not create a monster in the first place

Network management is still the chief bugaboo of enterprisewide client/server networks. But the IS staff at Boston's Brigham and Women's Hospital didn't let horrific visions of unidentifiable server glitches or manual software updates to 4,200 clients scare them off. Their philosophy was, if you architect the network right—stressing homogeneity in boxes, operating systems and database servers—the management piece isn't so frightening.

Similarly, network management is more efficient when the focus is on network-spanning processes rather than wires and boxes. If processes like security, backup and printing are designed to be uniform across network systems, managers can request status data from the process or alter it—stopping, starting, delaying or redirecting it. For example, with a single security system that spans all applications, the network manager could instantly change a user's sole password for every application.

Brigham's development team built three critical network-management components into the Open M operating environment.

An automated road map tracks, splits and apportions data across all database servers while applications are running. This allows the network manager to shift data locations in response to performance bottlenecks.

The second component monitors the validity of data caches. If a data set is modified after another user has pulled up a previous version in cache, the system will inform the user that the cached version is no longer valid.

Each of 35 database servers has a shadow server functioning as a "hot backup." To maintain up-to-the-second redundancy, the shadows mirror each transaction done on the primary servers.

The simpler network gaffes—process interruptions, program reboots and missing data imports—are healed by the network itself without intervention from a manager. Seventy percent of errors are taken care of this way.

Another tool Brigham and Women's staff rely on is an internally developed "airline screen," modeled after the airport monitors that list flight arrival and departure times. This single-screen visual interface reports the status of servers, shadows, routers, key clients and the physical layer of the network.

–R. Pastore

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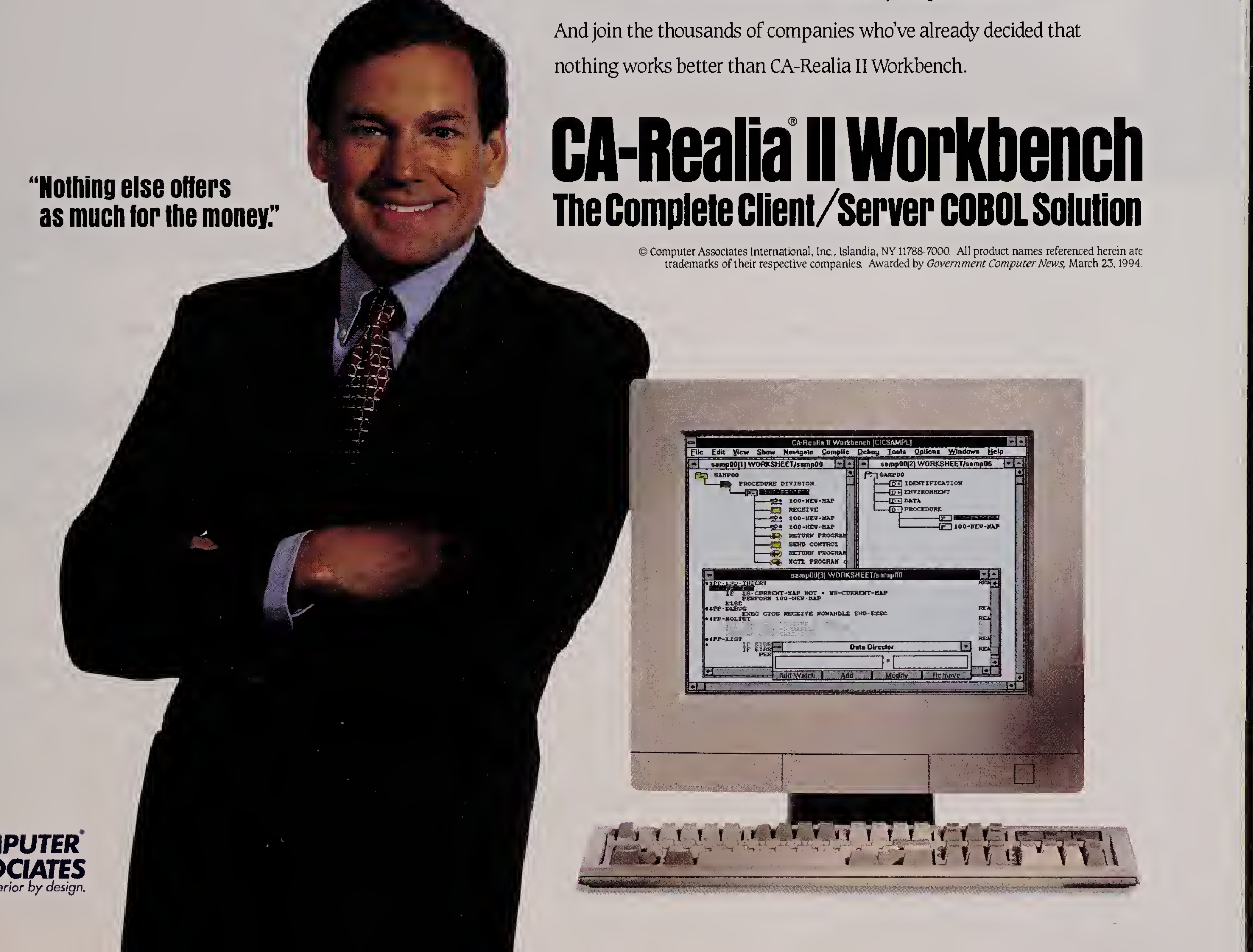

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     ELSE
*$PP-DEBUG
          EXEC CICS RECEIVE NOHANDLE END-EXEC
*$PP-NOLIST
*$PP-LIST
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CHRISTINE COLLINS: *"Users need to be involved. Before you ask someone to program something, you should understand the flow of the process and how it would be done manually."*

and even such extras as coffee and donuts while they wait. Typically, these services are not easy to provide in facilities as big and sprawling as Brigham and Women's, which spans four city blocks.

The Future

The final application conversion may have marked an end to the migration project, but the system is far from finished. "I don't see us doing another quantum leap like this for some time," Glaser says. But smaller changes are already in the works. Windows NT will replace DOS as the server software upon which Open M runs, and Microsoft Workgroup for Windows will manage the desktop applications and enable multitasking. IS will write new applications in Visual Basic rather than Open M's language in order to take advantage of the richer Windows toolset.

Brigham is currently merging with Boston's Massachusetts General Hospital, creating the state's third-largest employer and one of the country's largest health-care providers. Discussions are underway as to which systems will be adopted by the combined enterprise. But industry observers feel the outcome is fairly apparent, since Mass General, like many institutions, is burdened with islands of automation.

If Brigham and Women's network is extended to another hospital with a potential 5,000 more nodes on the other side of Boston, will it be any easier to convince skeptics that this kind of client/server system will work? Glaser will have to wait until the next conference he addresses to find out. In the meantime, the proof is all around him. CIO

Technical Profile

Brigham and Women's Hospital, Boston (a teaching affiliate of Harvard Medical School)

Beds: 712

Employees: 8,485

IS Staff: 92

Gross Revenues: $612 million (fiscal 1994)

IS Budget: $4.2 million capital and $7 million operating

Users: 7,370, accounting for 40,000 log-ons daily to Open M-based applications

Nodes: 4,200 386- and 486-based Compaq Computer Corp. clients (2,300 simultaneously active at peak)

Servers: 35 database servers, each with a shadow server; 20 NetWare servers; 72 server/routers

Storage: 100GB of primary fixed media

Physical Network: IBM Token Ring; two backbone rings

Operating Systems: InterSystems Corp. Open M database-management environment, Novell Inc. NetWare, adding Microsoft Corp. Windows NT and Workgroup for Windows

Applications: 89 internally developed administrative, financial and clinical systems; 40 PC-based applications developed in Borland International Inc. Paradox

Transaction-Processing Performance: At peak, 120 transactions per second and 14,000 database accesses per second

PHOTO BY JAY REED

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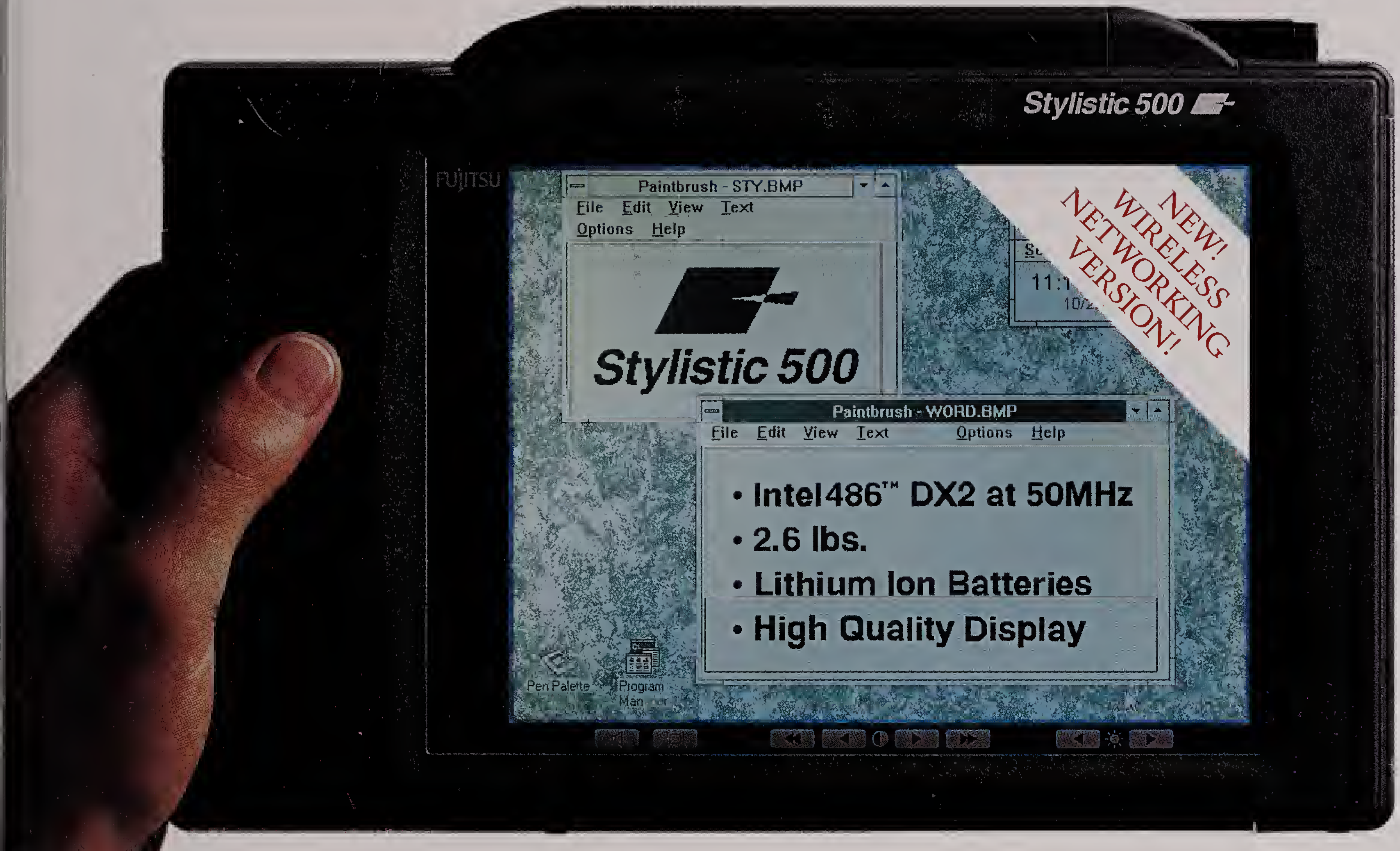

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Supporting Players

Software publishers, long resistant to turning their customers over to the company of strangers, are finding that third-party relationships can provide a win-win solution to issues of technical support

ONE OF THE KEY NOTES TRUMPETED BY MANagement gurus as essential to any firm's song of success is to stay as close to your customers as possible. To software publishers, the thought of farming out something as critical as technical support traditionally conjured up images of building barriers between themselves and their customers. "Companies used to view support as a way to keep their finger on the pulse of the business, as a way to communicate with their customers and get direct feedback about their product," says Joseph Jacoboni, president and CEO of Software Support Inc. in Heathrow, Fla. "It was always considered a sacred cow that would never be outsourced."

Now that sacred cow has been let out to graze in someone else's pasture. Microsoft Corp., for example, hasn't yet released Windows 95, but it has already announced its third-party support vendors for the product—Digital Equipment Corp., Keane Inc., MicroAge Computer Centers Inc., Softmart Inc. and Unisys Corp. "This is the first time that we've ever done a public announcement of an outsourcing relationship," says Linda Glenicki, general manager for end user support at Microsoft.

BY JOHN P. MELLO JR.

ILLUSTRATION BY TED PITTS

Revenue growth among third-party support companies reflects the rush to farm out support. Upgrade Corp. of America, based in Buffalo, N.Y., nearly doubled its revenues between 1993 and 1994, from $74 million to about $140 million.

"In the last 18 months, there's been a collective agreement in the software publishing community that outsourcing makes sense," says Julie Schoenfeld, vice president of services sales at Stream International Inc. in Norwood, Mass., a third-party support company with $1.3 billion in revenues. "It used to be that when you were selling outsourcing, you'd have to spend a lot of time explaining the economics to people. Now when software publishers come to us, they're ready to roll."

One reason for the change of heart is that the software industry has seen its margins melt like a witch in water. When margins were fat and discounts were slim, software companies boasted that support was a crucial reason for paying retail for a software package. But applications that used to sell for $395 now sell for $99, forcing publishers to take a hard look at their support services.

"The suggested retail prices of software have fallen dramatically," says Jacoboni. "As a result, the margin dollars for software publishers have decreased to the point where they can't afford to give away unlimited free support."

The cost to a software publisher for fielding a support call underscores that point: $20 to $25 per call, versus $5 to $10 for third-party vendors, according to Jeffrey Tarter, editor and publisher of *Soft•Letter* in Watertown, Mass. "Third-party support vendors are ruthlessly efficient," he says.

IN ADDITION TO HELPING manage the bottom line, software publishers say third-party support companies can also help manage the front line. They can handle the phones during off-peak hours and step into the breech when demand gets hairy. "Outsourcing can smooth out the peaks and valleys of support," observes Tarter. "A typical support organization is inundated when there's an upgrade."

That is certainly a concern at Microsoft as it prepares for what it sees as one of the largest launches in its history. "With Windows 95, we need a support structure in place to meet the expected launch spike that you tend to see when a product first releases," Glenicki says. "Partnering with a number of different vendors provides us with the kind of flexibility we would have never been able to

A Little Help From Your Friends

Third-party support vendors offer a cohesive approach to getting the desktop under control

More and more, corporations are turning to third parties to take over the functions traditionally routed to an internal "help desk" and to sweep what's becoming an increasingly tangled web of applications, networks and servers out from under their umbrellas.

Less than 5 percent of the nation's corporations are effectively quantifying or controlling spending on PCs and LANs, according to a 1994 study by the International Technology Group of Mountain View, Calif. "Some corporations are finding that the desktop environment is out of control," observes Ted Bullock, vice president of division operations for Unisys Customer Services Worldwide in Blue Bell, Pa. "Companies are throwing up their hands like never before and saying, 'I need some help.'"

Often, those companies are hard pressed to rationalize an organization-wide desktop environment that includes networking, server and desktop products. "There are a lot of people making a lot of decisions on what they do on their desktop," says Bullock. "Managers come to us looking for someone to help them understand this whole thing because it's getting so complex. It's beginning to affect the enterprise's productivity."

The multivendor environment within many corporations can be a headache for users as well as managers. As networks and PCs proliferate, so do software packages. "If you're integrating a Microsoft application with a Lotus application, for example, Lotus isn't going to address an issue if it believes it's a Microsoft problem," explains Joseph Jacoboni, president and CEO of Software Support Inc. in Heathrow, Fla. "And if Microsoft believes it's a Lotus problem, it's not going to address the problem, either. It becomes a finger-pointing exercise."

"End users often have no single place to go to solve a problem," says Bullock. "They have to call each of the different vendors—some that offer free support, some that make you wait a long time on their help line, some that have no on-site capability and some that have no support structure at all."

An outsourcer like Unisys can create a universal help desk tailored to the software and hardware the company is running. Users are given a single 800 number to call for answers to all their questions. Usually call reports are submitted to the company by the outsourcer on a monthly basis, a useful tool for discovering ongoing operational issues such as failing hardware components or the need for more employee training.

Increasingly, users will need multivendor resolutions to their problems. "The notion of multivendor support is creating a growing market for third-party support," says Julie Schoenfeld, vice president of services sales at Stream International Inc. in Norwood, Mass. "Reengineering is causing people to achieve trying to meet that support peak entirely on our own."

There are other benefits to companies like Microsoft. For one, it doesn't have to hire scads of people only to lay them off later when demand for support flattens. "Outsourcing allows a software company to have the right number of people on the phones at the right time without adding permanent staff," notes Peter O'Dell, CIO at Upgrade Corp. of America. In addition, software publishers don't have to divert money from product development into developing and maintaining an underutilized support infrastructure. "Customer support is our sole raison d'être," says Jacoboni. "As a result, we can more efficiently manage the 'metrics' of the business—time

look at their companies and ask, 'Should we make or should we buy?' When it comes to software support," she says, "the decision to buy usually wins."

"The problem is usually that many corporations today have not built a cohesive support structure," says Bullock. "They've built it de facto, in cells. We're not seeing a uniform approach, because individual business units or departments are going in their own direction." Providing a cohesive approach is just one way a third party working for several vendors can solve problems that a single publisher can't.

Another way a third-party vendor can help is to tell the company exactly what it owns. "One of the services we provide is an asset-management service," Bullock says. "We go out and count everything they have, count their software licenses, find out what's connected to what. That way, they can understand what they have because, in many cases, they don't know." Unisys has been offering third-party support since the early '80s. According to Bullock, its support operation is the fastest-growing segment of the company's business.

Support pricing by software companies is also driving corporations toward third-party vendors, according to Jacoboni. "Individual agreements from each software publisher could quickly run up an annual support bill of $600 to $700 per user," he says. "If corporations bought an agreement from us, they'd pay $99 for support of all their applications."

For corporations, third-party support may offer another advantage over the support they might get from a software publisher: simpatico. Software publishers, accustomed to dealing with consumers, may not speak the language of the corporations. Outsourcers like Unisys and Hewlett-Packard Co., on the other hand, that have been in the corporate trenches for years can have a rapport with customers that consumer-oriented organizations don't have. "We support Corporate America," says Jon Goulden, alliance manager for the software services and technology division of Hewlett-Packard in Mountain View, Calif. "We understand how to fulfill their needs, which are very different from home users' needs."

For companies that are supporting their workers' software internally, the efficiency of third-party support can be an eye-opener. "You're looking at somebody at an internal help desk taking 52 minutes to answer a customer's question versus eight to 10 minutes for us," Jacoboni says. "It doesn't take a rocket scientist to figure out what kind of productivity gains you get there."

Software Support cites several reasons why its help desk can outperform an internal one. Unlike the staff at an internal help desk, who may provide support as part of other duties, Software Support staff's focus is on support. A sophisticated routing scheme makes sure calls reach the person with the right skill sets to solve a problem. These technicians also have access to the company's broad knowledge base because of the numerous products it supports. And technicians look at callers as customers rather than co-workers, which creates more of an incentive to resolve a problem quickly and completely.

Another problem endemic to internal help desks is maintaining the competency level of support staff. "Companies are realizing they can spend a lot of money trying to keep up with shrinkwrapped software and the changes going on in that marketplace," Schoenfeld says. "We have access to upcoming releases, and we're very tied into changes in the marketplace as technologies come online."

Moreover, internal staff don't have an opportunity to build their expertise with various software packages, because they answer relatively few questions a day on them. A company like Stream International answers 20,000 calls a day on a variety of packages, so the company's staff is constantly building problem-solving expertise.

"Finally, we can spread our fixed costs over hundreds of companies, while a single company has to make a huge investment to get their help desk functional," Schoenfeld says.

–J.P. Mello Jr.

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spent with users, length of calls, abandonment rate and hold times."

But outsourcers can do more than relieve the financial burdens support places on a software publisher. Since support is the only thing these third-party companies do, they're better equipped to stay on top of emerging support technologies such as interactive voice response systems, fax-on-demand, voice recognition, automatic call routing and call tracking. And they can help design a support structure that turns the service into a revenue maker. Microsoft has such a multitiered support scheme where services can range from Premier Global Support—aimed at multinational corporations and selling at an annual base price of $225,000 for 10 users with a supplementary charge of $10,000 per additional user needing vendor support—to Priority Support, which can be obtained for $1.95 a minute.

> **"A SOFTWARE PUBLISHER'S PRIMARY FOCUS SHOULD BE DEVELOPING SOFTWARE. IF PUBLISHERS TAKE THEIR EYE OFF THE BALL, OTHERS WILL GRAB THEIR MARKET SHARE."**
>
> *–Joseph Jacoboni*

Of course, old-fashioned free support is still available during the warranty period of a product, usually 90 days. But the days of unlimited free support are a thing of the past. In many companies, the concept of support has gone from being a cost tacked on to the product to becoming an actual profit center, says Dave Champagne, vice president of worldwide customer support at Lotus Development Corp. in Cambridge, Mass.

WITH THE FABULOUS growth that third-party support providers have been experiencing, one wonders if software publishers, smarting from sagging margins, might someday want to return support to its original nesting place.

Not a chance, says Tarter. "I don't think you'll ever see a time when classic support becomes a profit center for a software company," he says. One reason is that two-thirds of all support calls generated by a product occur within the warranty period for the product. "There's no way a software publisher can eliminate free support; if basic support isn't provided, customers will just return the product," he says. "It's economic suicide not to help people over the early hurdles."

Moreover, software publishers reentering the support business as it exists now would require a substantial investment of time, money and intellectual resources. "What a publisher would have to do to be competitive in this marketplace is revamp how its organization looks at this business," Jacoboni says. "I don't know that many publishers would want to do that at this point."

Most important, it doesn't make sense for a publisher to get into the support business from a strategic point of view, argues Jacoboni. "A publisher's primary focus should be developing software," he says. "Software publishing is a highly competitive field. If publishers take their eye off the ball, others will grab their market share." Or worse, as Champagne points out: "If you get to the point where the service component has greater revenues than the licensing component, you have to ask yourself, 'Where's the future service revenue going to come from?'"

However, Tarter adds, one area where software publishers can increase revenues is in add-on services. "Large system, mainframe and client/server companies have known about it for years," he explains. "They make significant profits from maintenance contracts, training, consulting and all kinds of service-based products. Now we see software companies making money from these kinds of components." Even game companies, have discovered how to raise substantial revenues from selling books that suggest ways to navigate through their games, he observes.

SO WHAT ABOUT THE OLD fear of losing rapport with customers by delegating their care and feeding to strangers? First, software publishers aren't just handing the ball to a third-party vendor and heading for the sidelines on support issues. "Companies that contract with us for outsourcing are conducting customer satisfaction surveys to ensure that the quality is there," says Schoenfeld. "They are taking the time to develop the relationship so that they can monitor the quality."

Second, all that fancy infrastructure that outsourcers are investing in is tailored to collect and transmit to publishers information they'd be hard pressed to generate by themselves. Interactive voice response systems, for example, aren't just for incoming calls. Publishers can use the systems to manage inventory, track shipments, survey customers and request statistics gathered through services like tracking, where outsourcers slice and dice the information from calls they receive on a company's products to identify problem trends.

"We're providing companies with the kind of feedback they would get if those support seats were in their own house," says Joanne G. Biltekoff, director of special projects at Upgrade.

Adds Jacoboni, "Most software publishers we've worked with have told us that they're getting better information from us than they were when they were doing their support themselves."

John P. Mello Jr. is a freelance writer based in Woonsocket, R.I.

Application Form

Enterprise Value Awards For 1995

Honoring executives who craft innovative information technology solutions to enhance business value

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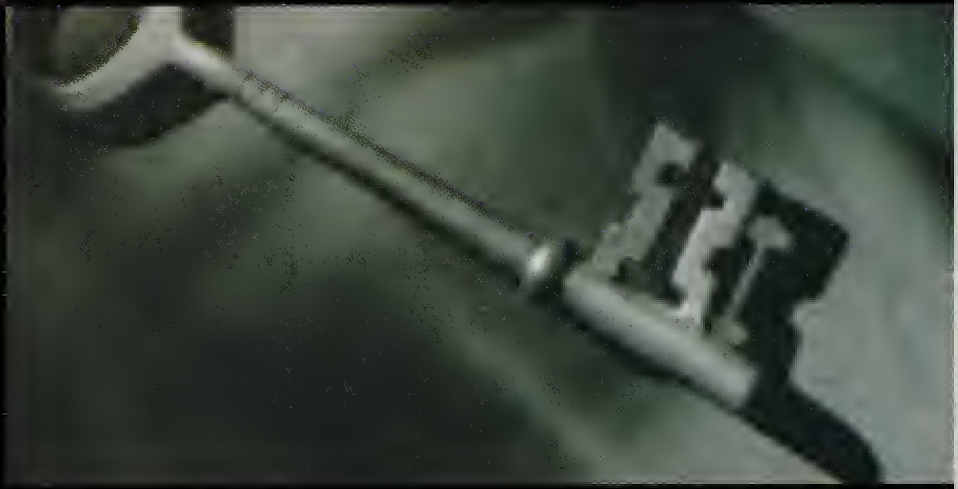

APPLICATION DEADLINE: JULY 1, 1995

4. THE NOMINATED ORGANIZATION

Please tell us about your organization (company, business unit, agency) in 500 words or less. Include information on:

- when the organization was founded;
- mission statement;
- major products and services;
- markets served;
- any other data you believe to be relevant in terms of general background.

5. THE NOMINATED SYSTEM

Tell us about the nominated system and demonstrate its importance to the organization by completing the following sections. Please limit your material to five pages.

- **OBJECTIVE:** Identify the primary business objectives of the IT investment.

- **SCOPE AND IMPACT:** Identify the functions (e.g., customer service, manufacturing, planning) that were changed by the system, the nature of those changes and their impact on the business. Identify other business-change initiatives tied to the IT investment.

- **ADDED BUSINESS VALUE:** Describe how the technology investment is furthering the organization's strategic objectives, including any new business initiatives. Note any significant event that would help us evaluate the nominated system's value. Examples might include a merger, a new distribution channel or a significant regulatory change.

- **THE IMPORTANCE OF IT:** Identify the different components of the overall business change (e.g., business reengineering, downsizing, cycle times). Explain the importance of the IT component to the overall business change. Could the results have been achieved without IT?

- **COLLABORATION:** Describe how the business unit and IS organization worked together throughout the project—from concept to implementation. What were the specific tasks fulfilled by the business unit? IS organization?

6. QUANTIFYING ROI

Please provide a detailed summary of the nominated system's investment costs (including all up-front development expenses and annual maintenance charges) and its ROI to date. Include reasonable estimates of indirect and/or "soft" benefits.

7. TECHNICAL PROFILE

Briefly describe the technology of the nominated system. Please include the names of major vendors and products. If you prefer, you may attach a document containing a technical description of the system, providing it is no more than five pages.

NOTE: The examples provided here are meant to be illustrative, not all-inclusive:

- Architecture (e.g., client/server, distributed, mainframe)
- Hardware (e.g., mainframe/parallel processor, minicomputer/server, desktop computers, handheld/portable devices)
- Software (e.g., operating systems, database system, shells, application software)
- Software development tools (e.g., CASE, 4GLs, GUI developers, object-oriented development tools)
- Networking/communications hardware, software and services (e.g., modems, routers, electronic-mail packages, carriers and public networks)

8. TRUTH OF INFORMATION/RELEASE

The following release must be signed by both nominating executives if the application is to be considered. *Unsigned releases will invalidate the entry.*

I HEREBY STATE that the information provided is true and complete to the best of my knowledge and belief.

I AUTHORIZE the release and use of, in connection with the Enterprise Value Awards program, any and all materials furnished by me or others at the company contacted for this judging. I understand that information submitted on this application or subsequently gathered during the evaluation and judging process may be used in articles or any other type of publicity relating to the Enterprise Value Awards program.

I ALSO AUTHORIZE the release and use of my name, my company's name and my likeness, including but not limited to any photographs and any recording of my voice or image that may be taken of me for *CIO* Magazine. I agree that no compensation shall be due me or my company for such usage.

I RECOGNIZE that failure to meet these conditions or to provide sufficient material that can be published can cause the application to be rejected at any point in the process at the sole discretion of the sponsors.

1. ____________________________________

▲ SIGNATURE OF NOMINATING I.S. EXECUTIVE

____

DATE

2. ____________________________________

▲ SIGNATURE OF NOMINATING BUSINESS EXECUTIVE

____

DATE

9. OTHER EDITORIAL OPPORTUNITIES

If you are not selected as an award recipient, are you willing to be contacted for inclusion in other articles in *CIO* Magazine? YES ☐ NO ☐

How did you learn about the Enterprise Value Awards program?

☐ *CIO* MAGAZINE
☐ CONSULTANT
☐ SYSTEMS INTEGRATOR
☐ PR AGENCY
☐ ADVERTISING AGENCY
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☐ IS STAFF MEMBER
☐ OTHER PUBLICATIONS
☐ VENDOR
☐ OTHER (PLEASE IDENTIFY) ____________________

CHECKLIST

HAVE YOU FILLED OUT...?

☐ Company/Business-Unit, Entrants and Supporters Information

HAVE YOU INCLUDED ON SEPARATE PAGES...?

☐ Nominated Organization
☐ Nominated System
☐ Technical Profile
☐ Additional Return on Investment Material

HAVE BOTH ENTRANTS SIGNED AND DATED...?

☐ Truth of Information/Release

HAVE YOU CHECKED OFF...?

☐ Other Editorial Opportunities
☐ How you learned about the Enterprise Value Awards program?

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JUDGES SELECT WINNERS: October 1995

ANNOUNCEMENT OF WINNERS: October 16, 1995

AWARDS CEREMONY: February 6, 1996 at the *CIO* Enterprise Value Summit

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3. A partnership between an IT and business executive

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On February 6, 1996 CIO will host a special awards ceremony honoring the winners at the annual *CIO* Enterprise Value Summit. If you would like to learn more about the *CIO* Enterprise Value Awards program, please call Tracey Grogan at (508) 935-4449.

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David M. Carlson
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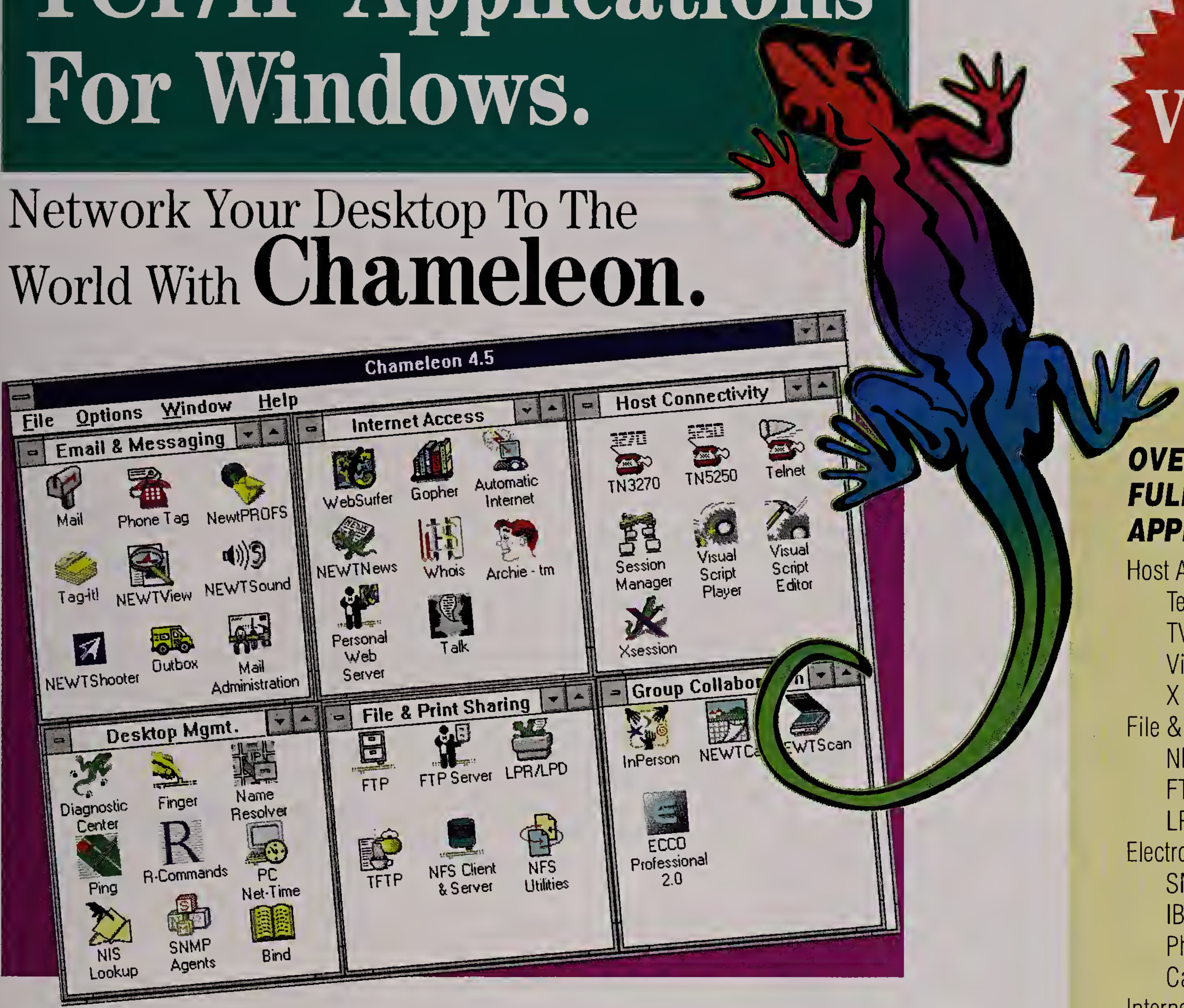

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The Year in Review

An index of all major articles published in *CIO* in the first six months of 1995, including a cross-reference by article type

Articles are numbered in sequence from the first issue of CIO. *(See past December issues for guides to stories published prior to January 1995.) To help readers find articles of interest, we've included a cross-reference of categories at the end of the listing. For example, readers interested in online strategies would look up 932 and 954.*

DECEMBER 15, 1994/ JANUARY 1, 1995

897. "Between a Rock and a Hard Place" *(Page 26)—reducing costs while maintaining quality is a challenge for most IS executives today. Second Opinions by Carol Hildebrand*

898. "Corporate Healers" *(Page 36)—organizations that have been through downsizing and reengineering must pay attention to healing wounds of layoff survivors. By E.B. Baatz*

899. "Cultivating an Information Culture" *(Page 46)—Thomas H. Davenport talks about managing the information culture for competitive advantage. By Leigh Buchanan*

900. "The Year in Review" *(Page 52)—an index of all major articles published in* CIO *in 1994, including a cross-reference by article type.*

901. "Adventures in Serviceland" *(Page 22)—client-centered by nature, professional-services firms practice what the reengineering gurus preach. An Insights column by James V. McGee*

902. "Information Imperative" *(Page 58)—IS executives ignore the information component of IT at their peril. A Reporter's Notebook column by Anne Stuart*

903. "No Place Like Home" *(Page 64)—remote technology is helping keep federal workers off the road and close to home. A Working Smart column by Tracy Mayor*

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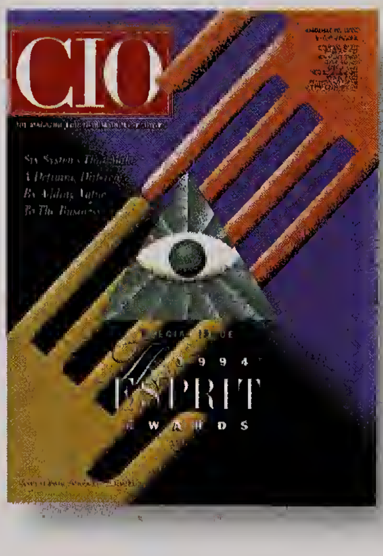
Special Issue: The ESPRIT Awards

904. "Harvest Season" *(Page 26)—an introduction to the 1994 Esprit Awards and honorees.*

905. "Garage Sales" *(Page 30)—integration of back-office functions has brought improved customer service and savings to a parking-facility management firm. By Carol Hildebrand*

906. "Making Them Pay" *(Page 36)—an automatic billing and accounts receivable system has brought in a previously uncollected $120 million to Massachusetts. By Richard Pastore*



907. "The Soul of a New Machine Seller" *(Page 42)—computer distributor PCs Compleat built itself around an enterprisewide information system, distinguishing it from its competitors and ensuring its success. By E.B. Baatz*

908. "Satisfying the Inn Crowd" *(Page 46)—a sophisticated central reservation system gave Hyatt Hotels new staying power. By Anne Stuart*

909. "On the Road Again" *(Page 50)— Caterpillar's Engine Division preserved its good name by giving service shops easy access to its mainframe. By Deidre Sullivan*

910. "A Seasoned Performer" *(Page 56)—Kmart's bid to recoup its fortunes includes a system that overhauls management of seasonal merchandise. By Megan Santosus*

911. "CIO's 1994 Readers' Choice Awards" *(Page 61)—our research group surveyed readers and came up with a list of leading technology vendors and products in five software and hardware categories.*

912. "Doing More With Lease" *(Page 20)—companies deciding to lease computer equipment must make sure they're getting the best deal. An Insights column by John E. Callies*

913. "The Name Game" *(Page 76)—is information technology making progress or do we just repackage it periodically? A CIO Confidential column by W.F. Dyle*

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914. "Playing to Win" *(Page 26)—CIOs and negotiators suggest strategies for getting the greatest possible value out of vendor contracts. By Mickey Williamson*

915. "Beneath the Big Dig" *(Page 34)—Boston's Central Artery Project has introduced radical techniques and a powerful information environment to American civil engineering. By Fred Hapgood*

916. "Franchise Players" *(Page 44)—franchise operators discuss how IT can be used to deliver top-notch customer operational practices among small, scattered outlets. By Mickey Williamson*

917. "Getting the Home Fires Burning" *(Page 52)—as telecommuting becomes more compelling, CIOs must determine their role in ensuring their companies' success. By Tracy Mayor*

918. "Tiger Teams" *(Page 22)—technology is often blamed for the failure of client/server projects usually caused by insufficiently trained people. A First Person column by Larry Runge*

919. "A Landmark System" *(Page 96)—Norfolk Southern's ability to sell and lease land was greatly improved by an IT-based reengineering of its archaic processes. A Working Smart column by Peter Fabris*

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Special Issue: Achieving Software Quality

920. "Beating the Bushes" *(Page 32)—there is no single solution to the problem of finding expert client/server programming help. By John P. Mello Jr.*

921. "Out-of-this-World Software" *(Page 40)—the space shuttle's onboard-systems team proves that error-free programming may be tough, but it isn't rocket science. By E.B. Baatz*

922. "Sharing Power Safely" *(Page 50)—without the right tools, providing end users with access to corporate data resources can be a disruptive rather than a productive experience. By Megan Santosus*

923. "Talking About an Evolution" *(Page 60)—an expert panel discusses embracing client/server successfully. By Mickey Williamson*

924. "Quality Quest" *(Page 26)—client/server application-development techniques are still emerging, but quality-control standards aren't as stringent as they might be. An Insights column by Capers Jones*

925. "The Network Toolbox" *(Page 70)—the growth in*

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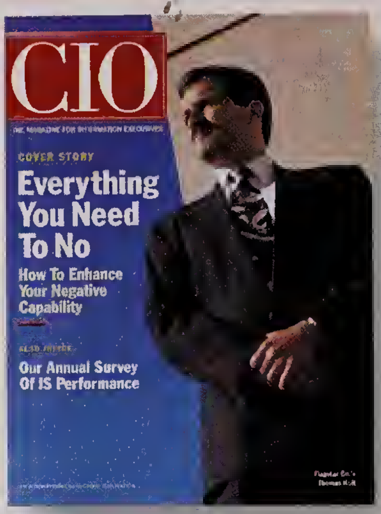
927. "Everything You Need to No" *(Page 34)—service-oriented CIOs with tight budgets walk a fine line when handling problematic requests from end users. By Richard Pastore*

928. "Performance Appraisal" *(Page 44)—everyone agrees on how CIOs can best serve their companies. Unfortunately, only CIOs think they're already doing it. By Mickey Williamson*

929. "The Adaptable Workforce" *(Page 56)—companies are struggling to find ways in which both the organization and the individual can thrive. By Anne Stuart*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930. "Shared Objectives" *(Page 68)—object-oriented information systems promise to make maintaining technology easier, but professionals must learn how to think in new ways. A State of the Art column by Robert Ettl, Peter Fingar and Dennis Read*

931. "A Helping Hand" *(Page 80)—support technology let Entergy Corp. decrease its number of help desks from 13 to two and facilitates trend analysis. A Working Smart column by Alice Dragoon*

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932. "Not-So-Easy Payment Plans" *(Page 34)—what's stalling Internet commerce? Chances are it's the lack of a safe way to lay your money down. By Fred Hapgood*

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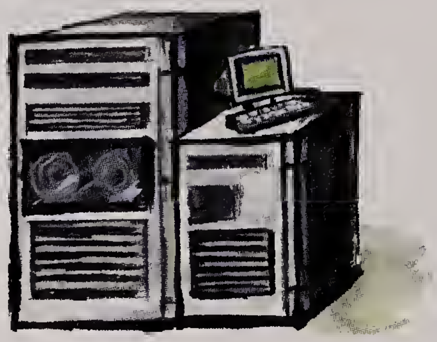
One Decision Maker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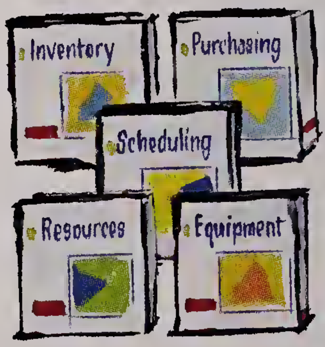

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940. “The State of the Unions” *(Page 54)—organized labor fights to hold the line on job losses while ensuring its members have the technological know-how to compete for future jobs. By Tracy Mayor*

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942. “They Also Serve” *(Page 28)—those who know how to think about a business with technology’s capability in mind are being deployed throughout the organization. An Insights column by Robert F. Morison*

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948. “A New Purchase Order” *(Page 60)—Steven Kelman, director of the Office of Federal Procurement Policy, has a mission to make the government’s acquisition process look more like corporate America’s. By Leigh Buchanan*

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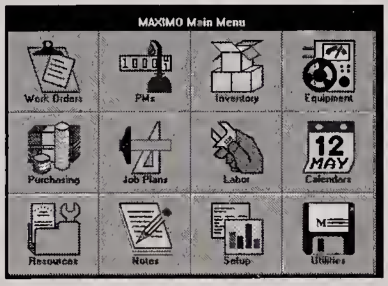

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955. "The Economics of EDI" *(Page 62)—everyone raves about the benefits of electronic data interchange, but is anybody really counting? By Tracy Mayor*

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962. "The New IS Role Models" *(Page 62)—the role of senior IS executives is splintering, transmogrifying and regenerating. Today there are various models of IS organization and leadership. By Anne Stuart*

963. "A Report Card" *(Page 24)—most management-reporting systems would receive less than a passing grade. Fortunately, the typical problems are easy to address. An Insights column by Ido Millet*

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965. "The Technology Tease" *(Page 80)—let Ezra's brand-new consultancy show you the power of implied technology. A CIO Light column by Ezra Poundcake*

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977. "Winning the Mobile Game" *(Page 26)—the key to victory is choosing the appropriate information access and delivery technologies. An Insights column by Sami Jajeh*

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979. "In the Chips" *(Page 72)—the choices are many, the certainties few. CIOs looking to standardize on a single PC microprocessor platform face a difficult decision. A State of the Art column by John Edwards*

980. "Fast-Acting Medicine" *(Page 80)—with a little expert help, FoxMeyer developed client/server applications in 90 days—and gained the expertise and speed it needed to take the architecture enterprisewide. A Working Smart column by E.B. Baatz*

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Technology Overviews *925, 930, 938, 941, 943, 950, 957, 963, 964, 970, 972, 977, 978*

Communications Technology/Networking *903, 916, 917, 947, 952, 955, 957, 977*

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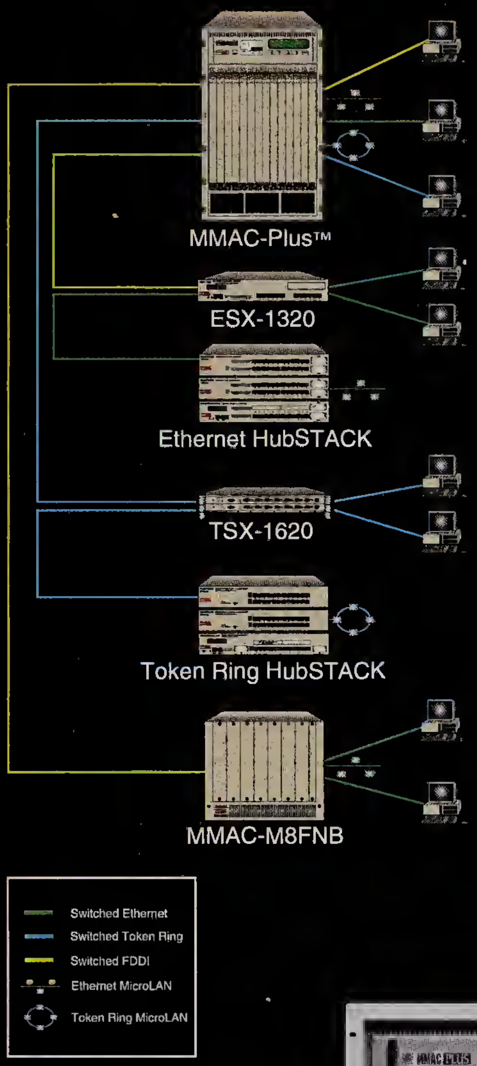

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In the Chips

The choices are many, the certainties, few. CIOs looking to standardize on a single PC microprocessor platform face a difficult decision.

BY JOHN EDWARDS

"Simplify, simplify," urged Henry David Thoreau in *Walden*. IS executives confronted with the dizzying complexity of today's PC microprocessor market may well be tempted to shout out the same advice.

Only a few years ago, the PC domain could be neatly divided between the Intel Corp. and Motorola Inc. camps. But today's fractured market also includes computers based on microprocessors from such diverse sources as Advanced Micro Devices Inc., Cyrix Corp., NexGen Inc., Digital Equipment Corp., MIPS Technologies Inc. and Sun Microsystems Inc., not to mention the grand PowerPC alliance of Apple Computer Inc., IBM Corp. and Motorola.

For the CIO looking to focus an organization's PC strategy on a single platform, the choices can be confusing, even overwhelming. Do you play things safely by sticking with a market stalwart, like Intel, or should you toss security to the wind and commit to a newer—but relatively untried—microprocessor that offers a performance advantage and, perhaps, a smaller price tag? This perplexing choice just didn't exist in earlier, simpler times.

If you place a high value on security, it's reassuring to know that the clear market leader among current-generation microprocessors is Intel's Pentium, which is now available at speeds ranging from 60MHz to 120MHz. Despite the notorious floating-point bug debacle in late 1994, the Pentium remains the standard for most PC makers as well as competing chip makers that hope to grab a share of Intel's market.

Waverly Deutsch, computing strategy services analyst at Forrester Research Inc., a market research company in Cambridge, Mass., points out that Intel dominates that microprocessor market in much the same way that Microsoft Corp. commands the operating system field. "It's currently an Intel world," she says. "However, there's a strong enough market to support multiple players, even though they're small." Deutsch adds that Intel's recent Pentium woes have emboldened its competitors, raising hopes that the chip giant isn't invulnerable.

One such competitor, a relatively obscure chip maker named NexGen, was the first company to bring a Pentium-compatible microprocessor to market. After several months of quietly selling its Nx586 line to smaller PC vendors—companies such as Lucky Computers and PC Concepts—NexGen raised numerous industry eyebrows in March 1995 when it announced that it had signed PC sales leader Compaq Computer Corp. as a customer. The move was viewed by many industry observers as a

ILLUSTRATION BY BRIAN AJHAR

brazen challenge to Intel's PC market dominance, although Compaq was already buying 486-level chips from Advanced Micro Devices, another Intel competitor. Deutsch notes that NexGen, like Advanced Micro Devices, plans to compete against Intel by offering PC vendors Pentium-level performance at a significantly lower price point—savings that presumably will be passed on to PC buyers. "The chip makers will try to convince whichever PC vendors they can that they offer more bang for the buck," she says.

Pocheng Shyu, an analyst at market research firm Frost & Sullivan in Mountain View, Calif., believes that Intel chips will probably always cost more than similar competing products. He notes that Intel can base its higher prices on its "Intel inside" prestige. But there's also another reason behind the price gap. "Intel's competitors have taken the view that they have to break into the market at any cost in order to have long-term viability, so price isn't a major consideration for them," says Shyu.

> **"Intel's competitors have taken the view that they have to break into the market at any cost in order to have long-term viability, so price isn't a major consideration for them."**
>
> *–Pocheng Shyu*

While NexGen was the first company to release a Pentium-compatible CPU, the market is set to gain additional challengers. Cyrix, for example, is scheduled to begin shipping its first M1 microprocessor later in the summer. But with the M1, Cyrix is taking a different path than NexGen. While NexGen is content to offer a product that more or less matches the Pentium's performance, Cyrix's M1 has been designed to offer PC makers both added value and extra performance.

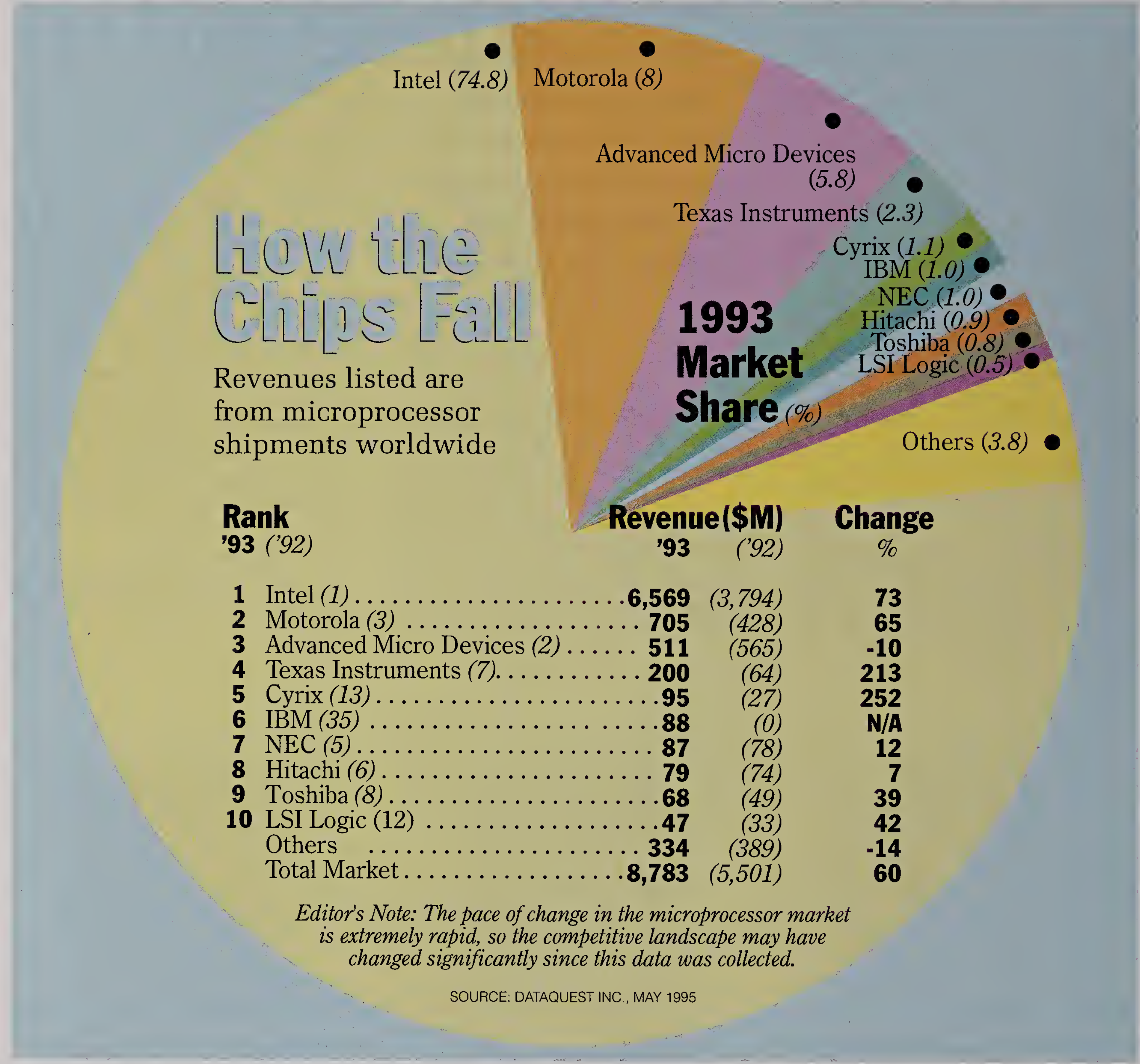
Although the initial M1 model runs at a relatively tame 100MHz, Cyrix asserts that its chip offers more than twice the performance of the Pentium at equivalent clock speeds. This claim is disputed by some analysts, who say the increase is closer to 20 or 30 percent. Still, the M1 has the potential to offer Intel some formidable competition. In addition, a 133MHz version of the M1 is due to appear in early 1996. The chip's biggest supporter among PC vendors is AST Research Inc., which plans to offer the M1 in several low-end desktop models.

Cyrix's M1 isn't the only "Pentium buster" on the horizon. With its new 100MHz K5 chip, Advanced Micro

Behind one of these doors is the right development tool for building high performance client/server applications.

How the Chips Fall

Revenues listed are from microprocessor shipments worldwide



Rank '93	('92)	Revenue ($M) '93	('92)	Change %
1	Intel *(1)*	6,569	*(3,794)*	73
2	Motorola *(3)*	705	*(428)*	65
3	Advanced Micro Devices *(2)*	511	*(565)*	-10
4	Texas Instruments *(7)*	200	*(64)*	213
5	Cyrix *(13)*	95	*(27)*	252
6	IBM *(35)*	88	*(0)*	N/A
7	NEC *(5)*	87	*(78)*	12
8	Hitachi *(6)*	79	*(74)*	7
9	Toshiba *(8)*	68	*(49)*	39
10	LSI Logic (12)	47	*(33)*	42
	Others	334	*(389)*	-14
	Total Market	8,783	*(5,501)*	60

Editor's Note: The pace of change in the microprocessor market is extremely rapid, so the competitive landscape may have changed significantly since this data was collected.

SOURCE: DATAQUEST INC., MAY 1995

Devices also aims to provide better-than-Pentium performance at a lower price. The K5 chip's operations are enhanced by breaking long x86 instructions into smaller computations, called "micro-ops," that can be processed more quickly. Boasting a SPECint92 industry benchmark rating of 130, the K5 beats the 100MHz Pentium's 100 rating. Quantity shipments are slated to begin in early 1996.

Needless to say, Intel isn't unaware of its competitors' moves. The microprocessor giant is planning to release its next-generation microprocessor, code-named P6, in the second half of 1995. The initial version will run at 133MHz and offer approximately double the performance of a 90MHz Pentium chip. The P6 has a SPECint92 rating of 133 and, like Advanced Micro Devices' K5, the device uses micro-ops to enhance operation. The P6 is scheduled to appear in PCs from Dell Computer Corp., AST, Hewlett-Packard Co. and a variety of other vendors.

Also in the works at Intel is the P7, a microprocessor the chip maker is co-developing with Hewlett-Packard. Slated for a 1997 release, the P7 will reportedly be a 64-bit chip that can perform as many as 1 billion instructions per second. The CPU will run HP's rendition of Unix but will probably also offer support for current-generation x86 instructions.

Shyu describes the P6 and P7 as "server chips" that will have little immediate impact on desktop PC buyers or users. Both devices reflect the current state of the microprocessor market, he says, but chip technology is progressing at a faster rate than is the software the chips are designed to work with. "These chips are really too powerful for mainstream desktop applications, so at first we'll see these

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products more or less exclusively used in network servers," he says.

The major alternative to current- and next-generation x86 microprocessors is the PowerPC series co-developed by Apple, IBM and Motorola. Although the PowerPC has so far had a rough time attracting the interest of computer vendors outside of the Macintosh arena, the alliance's partners plan to step up their attack on the x86 market with powerful new PowerPCs.

During 1995, the partners plan to make performance improvements across the PowerPC line, ranging from a 19 percent boost for the PowerPC 601 to a 113 percent gain for the PowerPC 603. By the time the updates are completed, the chips will be competitive with the Pentium as well as newer microprocessors. The 66MHz-to-110MHz PowerPC 601, for example, will have a SPECint92 rating of 62.6 to 115, compared with the 100MHz Pentium's 100. The enhanced 100MHz PowerPC 603 will offer a SPECint92 rating of 120, and the new 100MHz PowerPC 604, due out in summer 1995, will have a rating of 160, just below the P6's 200. To surpass P6 performance, buyers will have to turn to the high-end PowerPC 620, which will feature a SPECint92 rating of 225.

Matthew Towers, senior industry analyst at Frost & Sullivan, thinks the PowerPCs will gradually build market share over the next several years. "They'll 'chip' away at Intel, but slowly," he says. Towers notes that the PowerPC's biggest drawback is its inability to run x86 software directly. But with PowerPC versions of Windows NT and Microsoft's new object-oriented Cairo operating system in the works, the PowerPC partners should have an easier time making their case to mainstream PC vendors and users.

Often overlooked by computer buyers are some of the lesser-known devices that round out the microprocessor universe. These chips, including Digital Equipment's Alpha AXP, Sun Microsystems' SPARC, MIPS Technologies' R10000 and Hewlett-Packard's PA-RISC devices, are generally targeted at the server and workstation markets. The devices can provide substantial performance advantages to organizations that are willing to pay the price for extra power.

With PowerPC versions of Windows NT and Microsoft's new object-oriented Cairo operating system in the works, the PowerPC partners should have an easier time making their case to mainstream PC vendors and users.

In terms of raw processing power, the 64-bit Alpha AXP microprocessor series blows all Pentium and PowerPC chips away. For example, the high-end Alpha AXP 21164 CPU is the first chip to break the 300MHz barrier. With a SPECint92 rating of 330, the top Alpha AXP leaves PowerPC, Pentium, P6 and all other PC microprocessors in the dust.

But despite the Alpha AXP's stellar performance characteristics, potential adopters need to be aware of the product's drawbacks. For instance, while the Alpha chip runs the Windows NT, Unix and Open VMS operating systems directly, it can only run Windows and the forthcoming Windows 95 through a performance-robbing emulation mode. (Under emulation, the Alpha AXP's performance is approximately comparable to that of a 60MHz Pentium.) Then there's the matter of vendor support; Digital has yet to get a major vendor (other than itself) to commit to the Alpha. As a result, systems choices are limited to a relative handful of smaller, niche manufacturers. Finally, there's the chip's cost, which is staggering. In fact, one can purchase an entire Pentium-based multimedia system for the cost of the Alpha AXP 21164 CPU alone.

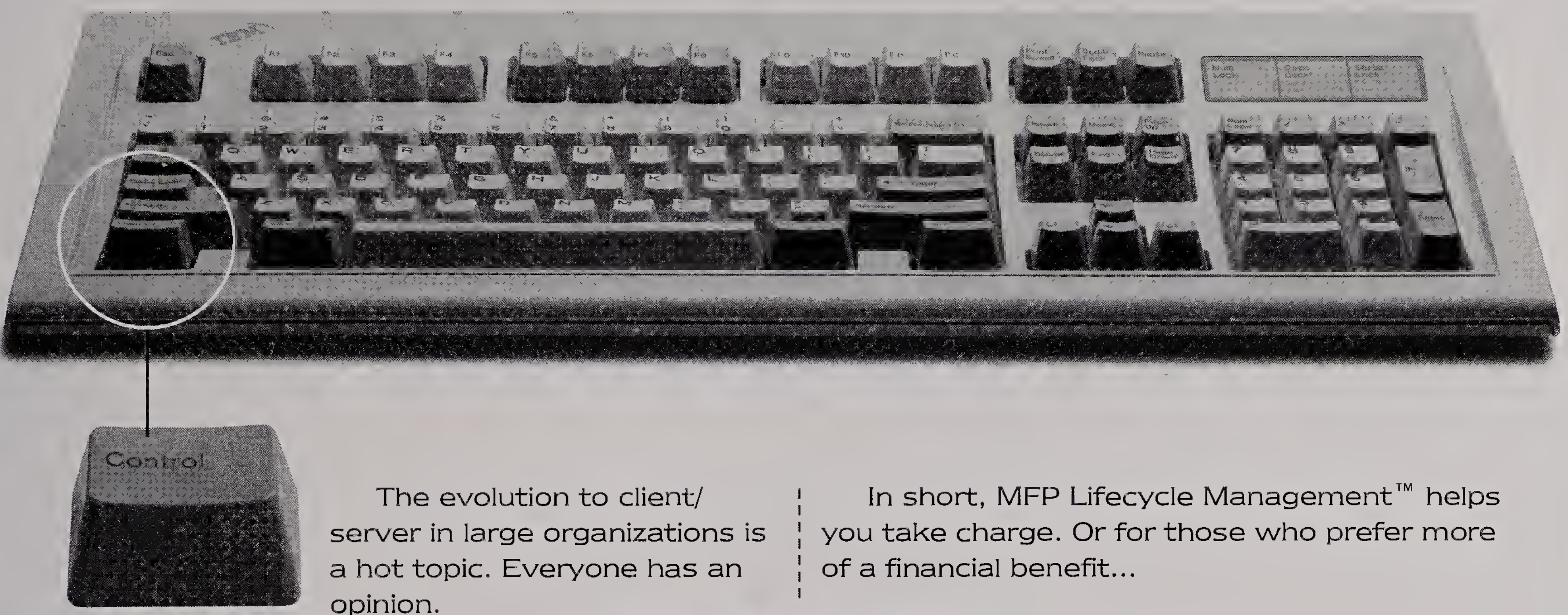
The same problems of high cost and operating system compatibility also prevent microprocessors from MIPS Technologies, Hewlett-Packard and Silicon Graphics Inc. from making their way into the mainstream PC market. In fact, Shyu doesn't see such chips ever obtaining a significant toehold in the PC community. "In terms of cost, they're two to three times more expensive [than current-generation x86 chips]," he says. "Plus, the number of applications written for these chips just doesn't compare with the Intel platform." He adds that while some workstations based on Sun Microsystems' SPARC can be purchased in the same general price range as high-end Pentium systems, SPARC also suffers from compatibility differences with x86 applications.

Jerry Banks, an analyst at market researcher Dataquest Inc. in San Jose, Calif., says the future of non-Intel-class microprocessors hinges to a large extent on the evolution of PC operating systems. Although Windows 95 still hasn't arrived and Cairo's release remains several months away, chip makers are anxiously waiting to see what future course Microsoft decides on. "Here's the question," says Banks. "Is Microsoft going to take its mainstream operating systems to the portable world, or is it going to continue to offer x86-specific products?" The answer depends on whether Microsoft decides to remain tied to Intel in a joint domination of the PC market, or if it chooses to strike out on its own and work with a wide range of chip makers, he says. "It's up in the air at the moment, but the implications are crucial for smaller chip makers."

What does the rapidly evolving microprocessor market mean for PC buyers? Deutsch says managers should concentrate on price and performance, not the chip maker. "Buyers really shouldn't care which chip is inside a computer," she says. "It's the PC vendor that guarantees the interoperability between the parts in the box and the software. It's the PC vendor that deals with the chip maker on compatibility issues. The issue for buyers is finding a PC vendor they can trust."

John Edwards is a freelance writer based in Mt. Laurel, N.J.

What's the one button they don't discuss in those client/server management seminars?



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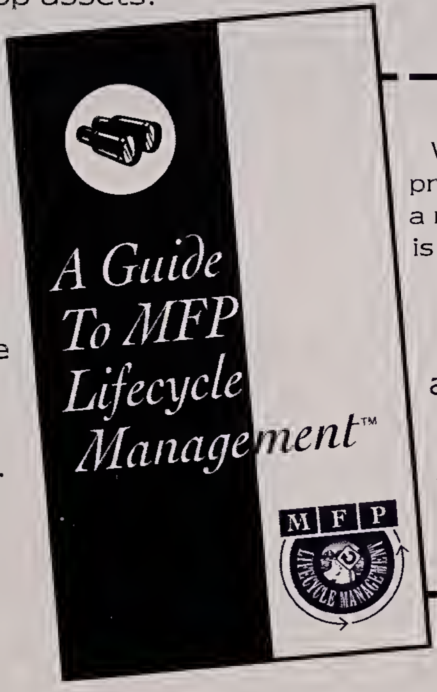

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Editorial, Advertising and Business Offices: 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208, (508) 872-0080. **Postal Information:** CIO (ISSN 0894-9301) is published semimonthly; monthly in July and August; and as a combined issue December 15/January 1 by CIO Communications Inc., 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208. Second-class postage paid at Framingham, MA, and at additional mailing offices. **Reprints:** Copyright 1995 by CIO Communications Inc. All rights reserved. Reproduction of material appearing in CIO is forbidden without written permission. Send all reprint requests to Permissions Editor, CIO, 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208. **Photocopy Rights:** Permission to photocopy for internal or personal use or the internal or personal use of specific clients is granted by CIO for users through the Copyright Clearance Center (CCC), provided that the base fee of $3.00 per copy of the article, plus $.50 per page is paid directly to Copyright Clearance Center, 27 Congress Street, Salem, Massachusetts 01970. Please specify: ISSN 0894-9301. Permission to photocopy does not extend to contributed articles followed by this symbol: ‡. **Subscriptions:** Address inquiries to CIO, 492 Old Connecticut Path, P.O. Box 9208, Framingham, Massachusetts 01701-9208. CIO is free to qualified information executives. To all others the one-year basic rate is $98 for U.S. and Canada, $185 to foreign countries (payable in U.S. funds only). The single copy price is $7. Please allow 4 to 6 weeks for new subscriptions to begin. **Change of Address:** Please fax a copy of current subscription label along with new address to (508) 872-0618. Allow 4 to 6 weeks for change to take effect. **Postmaster:** Send change of address to CIO, P.O. Box 489, Northbrook, Illinois 60065-9816.

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Fast-Acting Medicine

With a little expert help, FoxMeyer developed client/server applications in 90 days—and gained the expertise and speed it needed to take the architecture enterprisewide

While health-care reform was making its slow—and ultimately futile—path through Congress in 1993, officials at Carrollton, Texas, pharmaceuticals distributor FoxMeyer Health Corp. were trying to speed the development of new business applications. Profit margins, which had always been tight, were being squeezed further by both drug suppliers and customers. Indeed, 50 percent of the drug wholesalers that existed in 1980 had since dropped out of the marketplace. "We knew that if we didn't change quickly, we'd fall out too," says CIO Doug Schwinn.

The company was still tied to a legacy system that had the purchasing department, for example, generating reports manually. New applications required writing new Cobol code, with the result that projects were taking a year or more each to complete. "We decided to move to client/server," says Schwinn.

But with little client/server expertise in-house—and worried by the horror stories of massive client/server failures throughout the industry—Schwinn was reluctant to move into a new architecture. "So instead, we decided to apply client/server technology to specific business applications, and to do so in an iterative way."

In mid-1993, the $5.4 billion company set out to develop and deploy two new client/server-based tactical business applications for its promotions program and its purchasing department.

Schwinn wanted to hire consultants to help him and his 140 IS employees develop some new business applications piecemeal, in 90-day increments. The 90-day development cycle would give the firm four opportunities each year to improve the applications, as well as allow room for failure without risking too much money, Schwinn says. The main goal, however, was to get FoxMeyer's IS staff up to speed on client/server so that eventually an enterprisewide transaction processing system could be built.

After an extensive search, FoxMeyer hired BSG Inc. of Houston. First, BSG conducted a requirements analysis; then, project teams—made up of BSG and FoxMeyer employees in about equal proportions—were assigned to each development project. "The idea was that BSG would show us how to do it and then hand the project off to us but would remain by our side to help us if we got stuck," says Schwinn.

The first project, called Promotional Merchandising Allowances (PMA), began in the fall of 1993. The company had used a time-intensive process to capture, track and facilitate the management of drug manufacturers' sales promotions. The drug maker filled out a paper form with promotion details such as time frame, products and prices. FoxMeyer then routed the form internally to various departments for review and approval. The process took 14 days from the time the manufacturer said it wanted to run a promotion to the time the HMO and hospitals got word of the special deal. PMA, built in the required 90 days using BSG's BluePrint 3.0 tools for rapid application development and Powersoft's PowerBuilder, automated the workflow and cut the processing time to two days.

Work on the second application, called Buyer's Workbench, began in late 1993. With 14 purchasing agents, hundreds of vendors and 80,000 products across FoxMeyer's 16 distribution centers, the supply of products had to run smoothly through the pipeline. Previously, buyers would manually retrieve data from the mainframe to analyze when to replenish stock on a given product. Now buyers can respond more quickly by using Windows PCs to access a Sybase relational database for automated reports and analysis. Today, FoxMeyer is deploying a SAP database for its enterprisewide transaction system.

Success has been sweet, with one exception. Says Schwinn, "Our employees have become targets for headhunters; we've been raided pretty heavily." *–E.B. Baatz*

VITAL STATISTICS

Organization: *FoxMeyer Health Corp., Carrollton, Texas*

Applications: *Promotional Merchandising Allowances for tracking vendor promotions and Buyer's Workbench for the purchasing department*

Technologies: *A Sybase relational database on an HP 9000 Series Unix server, with Windows 486 PCs connected via a Novell LAN; for application development, BSG's BluePrint and Powersoft's PowerBuilder*

Scope: *PMA deployed to two dozen employees across several departments; Buyer's Workbench deployed to 14 purchasing agents across 16 distribution centers*

Sponsor: *Doug Schwinn, CIO*

Objective: *To develop client/server and rapid-development expertise to facilitate an eventual enterprisewide move to client/server*

Payoff: *The quick development of in-house client/server applications; time saved in manufacturer promotions and purchasing transactions management*

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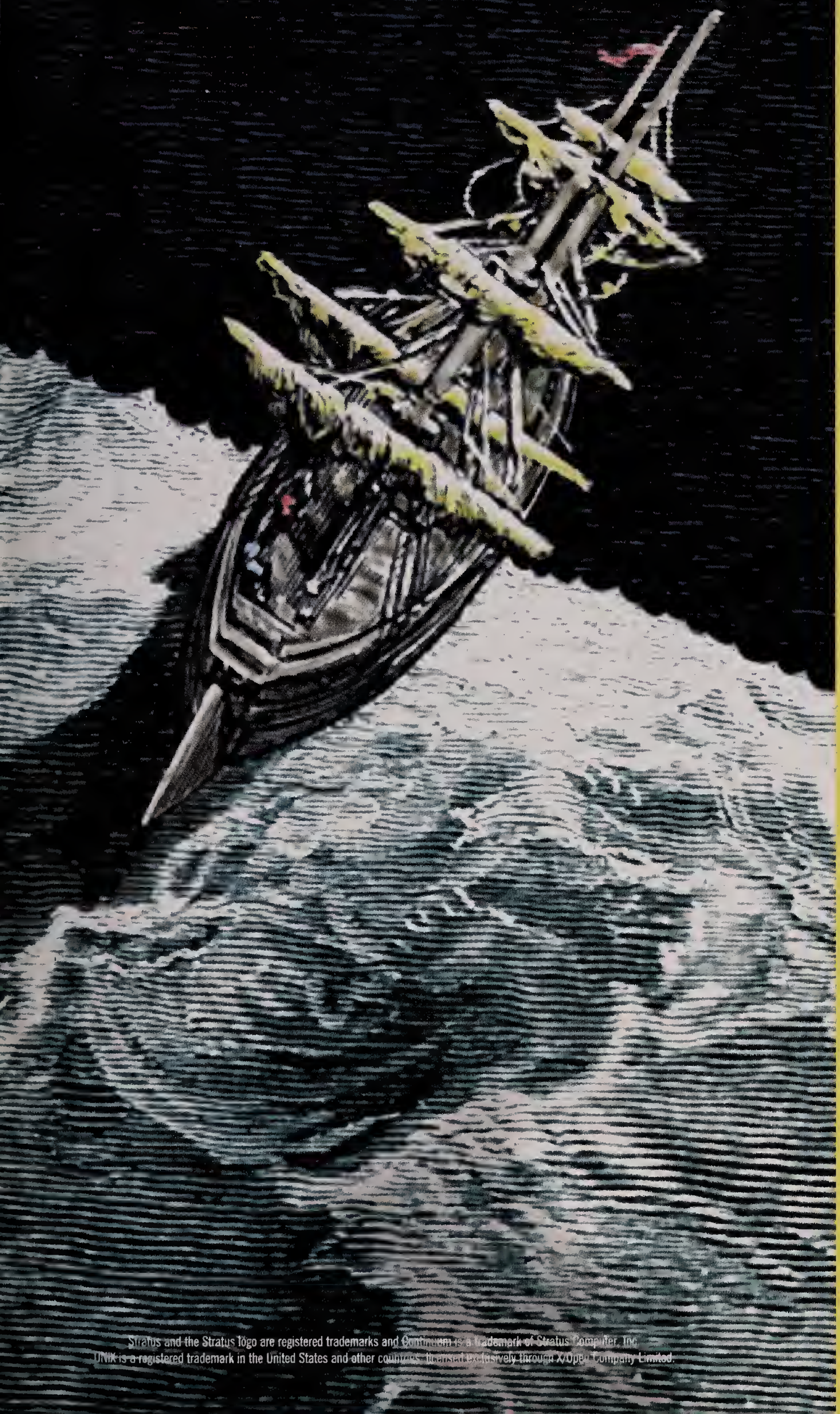

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